

APRIL 1, 1953

AUTOMOTIVE and AVIATION MANUFACTURING

ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue . . . Fully Conveyorized Tank Plant · · · Automotive Uses

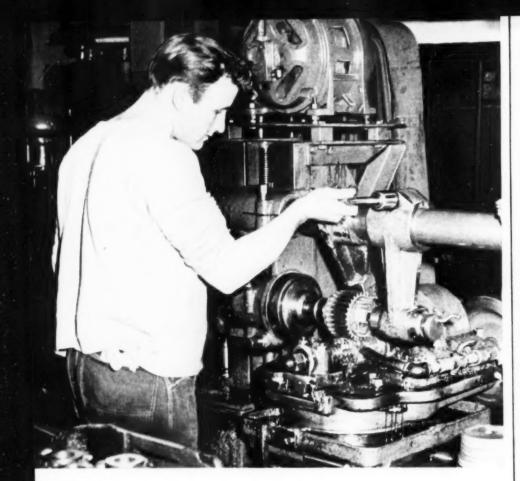
for Reinforced Plastics · · · Knockdown Type Bus · · ·

Connecting Rod and Piston Automation · · · Turnpike

Expansion · · · Armstrong-Siddeley Sapphire Engine

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CHILTON PUBLICATION



Hob life increased 75%

• The Gear Products Company, St. Louis, Missouri, tried various cutting oils for the hobbing of door latch spur gears from a free machining steel. With the best of the oils, an average of only 600 pieces could be produced before hobs required sharpening.

A Standard Oil lubrication specialist recommended Premier Cutting Oil, a light-colored, sulfurized cutting fluid. With the use of Premier, an average of 1050 pieces have been produced before hobs have required sharpening—a 75% increase of hob life. Less downtime for tool changes has resulted in higher production. Fewer sharpenings have significantly reduced tool costs.

The Gear Products Company, specializing in precision gears, gear trains, now uses Premier Cutting Oil for the majority of its gear cutting jobs. This has simplified both stocking and application of cutting oil.

Whether you have a specific problem or are looking for better results, a Standard Oil lubrication specialist can help you. His experience and special training are backed by one of the finest and most complete lines of cutting oils and lubricants on the market. You can contact him easily by phoning your local Standard Oil (Indiana) office. Or write: Standard Oil Company, 910 S. Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?



Fred. H. Moulton, lubrication specialist in Standard Oil's St. Louis office, worked closely with the Gear Products Company to help them get significantly greater tool life on the hobbing job described at the left.

To help you get better results with cutting oils and lubricants, Standard Oil has a corps of lubrication specialists located throughout the Midwest. One of these men is near your plant. He will give you the assistance you need when you need it. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings. You can reach him quickly and easily by phoning your local Standard Oil Company office. His services are backed by a supply set-up that is unique in the oil industry and that can mean convenience and savings for you

of additional compounding, this heavy-duty soluble oil possesses the cooling ability of an emulsion and also gives better tool life and finer finishes than do conventional soluble oils.

widely accepted products have demonstrated their ability to handle heavy stamping or drawing operations of low-carbon or alloy steels. Each of the three grades is a paste compound to which water can be added to provide the most economical applications. STANO-STAMPS offer maximum pro-

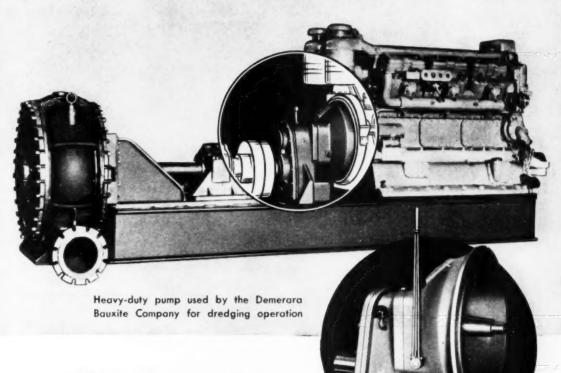
tection for dies and work, can be readily removed in conventional washing equipment.

STANDARD OIL COMPANY



(Indiana)

Another tough speed-reduction problem solved ...the low cost way!



with a heavy-duty
COTTA REDUCTION UNIT

This heavy-duty dredge pump has a tough assignment in British Guiana. Operation is continuous... machinery is exposed to the atmosphere... and it's a long way to the nearest repair or service station.

The dredge builder selected a Cotta Heavy-Duty Reduction Unit to balance the high engine speeds with pump load requirements. Reason—Cotta Reduction Units have time-proved heavy-duty features necessary for continuous, high torque speed reduction applications. You can count on

them — thousands are in operation all over the world — when costly repairs and down-time must be eliminated.

For cranes, drillers, locomotives, pumps, shovels, generators and other heavy-duty equipment... Cotta Reduction Units offer you top performance, low cost and extended service life. If your speed reduction problem requires these advantages, with input torque ranging from 150 to 2000 foot pounds, come to Cotta!

THIS INFORMATION WELL HELP YOU

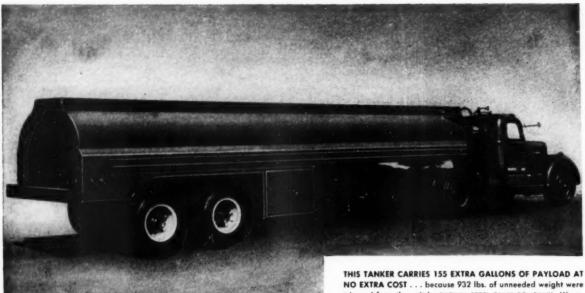
Sent free on request—diagrams, capacity tables, dimensions, and complete specifications. State your problem—COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA HEAVY-BUTY REDUCTION UNITS

"Engineered-to-order"



trimmed from the unit by BROWN STEEL TANK COMPANY, Minneapolis 14, Minn. To assure ample stamina for carrying 7,000 gallons of gasoline under all sorts of conditions, the builder utilized a high strength, low nickel alloyed steel trade-named COR-TEN . . . produced by U. S. STEEL CORPORATION.

CUTS DEADWEIGHT OF TANK TO PERMIT

932 Lbs. Additional Payload

Stretch your dollars by cutting deadweight. Redesign your transport units to utilize low alloy high strength steels containing nickel...

Every pound trimmed off not only saves fuel, but lessens wear on tires and brakes...reduces operating expense and increases revenue per ton mile.

Thin, light sections of low alloy high strength steel containing nickel permit substantial weight reductions by providing the same strength as thicker, heavier sections of plain carbon steel.

Compared to carbon steels of equal strength, these nickel alloy steels show superior behavior in fabrication, including welding and cold forming, frequently effecting a decrease in working costs and production time per unit structure.

The ability to resist many types of corrosion is another valuable characteristic of low alloy high strength steel sheets containing nickel. This property helps to lengthen the service life of vehicle bodies.

These steels containing nickel along with other alloying elements, are produced under various trade names by leading steel companies. Specify nickel alloyed steels to save weight without sacrificing strength and safety.

At the present time, nickel is available for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

AUTOMOTIVE INDUSTRIES

APRIL 1, 1953

VOL. 108, NO. 7

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MEMBER

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INTERNATIONAL HARVESTER

LOWER COSTS AND
MUCH CLEANER
OPERATION

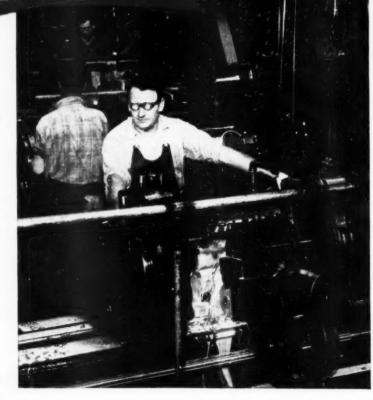
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"Results were outstanding," International Harvester reports. "With Texaco Soluble Oil C, lines stay clean—formerly flushed every two weeks, now flushed only twice a year. Tool life has increased. There is no appreciable odor problem."

Everywhere, Texaco Soluble Oils are noted for the stable emulsions they make, for the better machining results they give. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to enable you to do every type of machining better, faster and at lower cost.

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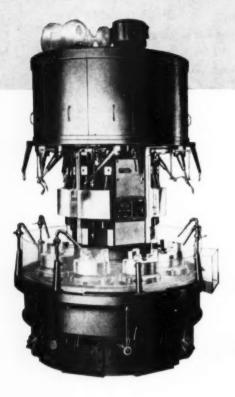
The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TUNE IN: Tuesday nights on television—the TEXACO STAR THEATER starring MILTON BERLE. See news. apr. for time and station.







16"—6 spindle type "D" Mult-Au-Matic for production of aeroplane motor forged Cylinder Heads showing sixth and loading stations.

Bullard Mult-Au-Matics have become a byword in the fields of high-speed production and manufacturing economy. Built with a backbone for sustained endurance they provide an economical manufacturing method easily adaptable to many classes of work.

These machines are outstanding in the automotive industry, which includes many products such as tractors, aeroplane engines, marine motors and a host of other items. The flexibility of Mult-Au-Matic provides for change-over from one design of a part to a new design of the same part or from one part to another of different design without basic change to the machine other than tooling and versatile changes of feeds, speeds and head adjustments.



Time saved is money earned. Write now for information.

SOLVING COMMON GASKET PROBLEMS

... with Accopac

Three interesting applications of Armstrong's new fiber gasket material

APPLICATION: Oil cup seal on power lawn mower

PROBLEM: Temperatures of $250^{\circ}-300^{\circ}$ F, demanded a heat-resistant gasket. However, the compressed asbestos-neoprene gaskets that were being used were too hard to permit a tight enough seal with thumb-screw pressure.

SOLUTION: To get the compressibility he needs for a tight seal under light flange pressure, this manufacturer now uses $\frac{1}{16}$ " Accopac* AN-702 (asbestos). In addition to its unusual compressibility, Accopac has excellent heat resistance . . . and won't harden and shrink when exposed to hot oil.



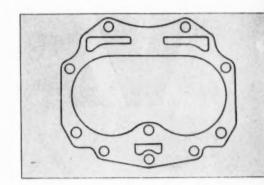
PROBLEM: Conventional glue-glycerine material was leaking badly. Hot lubricating oil was causing excessive gasket shrinkage. In addition, severe vibration often ruptured the gasket.

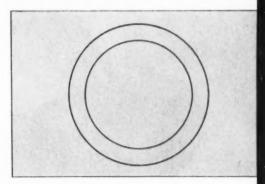
SOLUTION: Accopac CN-705 (cellulose) was tested as a replacement. Specifications called for at least 200,000 test cycles of leak-free performance. When tests were ended, Accopac had shown no signs of weakness in 569,000 cycles. This company's engineers say of Accopac, "It's the best fiber gasket we ever tested."

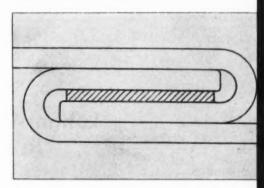
APPLICATION: Wall panel seal for textile drier

PROBLEM: Drier temperatures often reach 700° F. To eliminate heat loss caused by air leakage between sections, this manufacturer needed a compressible, impervious material capable of withstanding the high temperatures.

SOLUTION: Accopac AN-702 (asbestos) was tried. Because of its good compressibility and heat resistance, a ½64" strip of Accopac almost completely eliminated air leakage—and heat loss. The flexibility of asbestos Accopac means easy handling on the job and eliminates a major source of leaks.





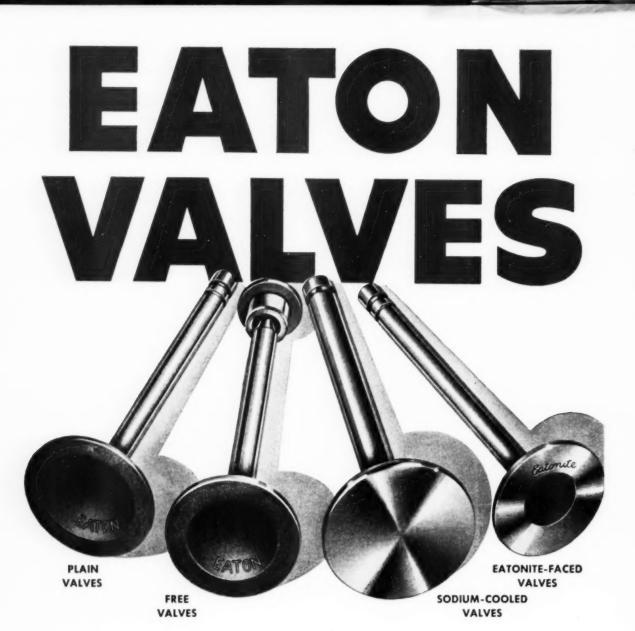




Try Accopac when you need something extra in a fiber gasket. This new material is made by an improved beater saturation process that locks each fiber in an even coat of rubber.

Accopac's strong, uniform composition gives it high crush resistance (100,000 psi), a wide range of compressibility, good dimensional stability, and imperviousness. Heat or fluid action won't cause Accopac to dry out and crack or shrink. A free booklet, "Armstrong's Gasket Materials," gives full information on Accopac. For your copy, call your nearest Armstrong Industrial Div. office or write Armstrong Cork Company, Industrial Div., 5804 Arch St., Lancaster, Penna.

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Longer Valve Life for ALL Engines in ALL Types of Service

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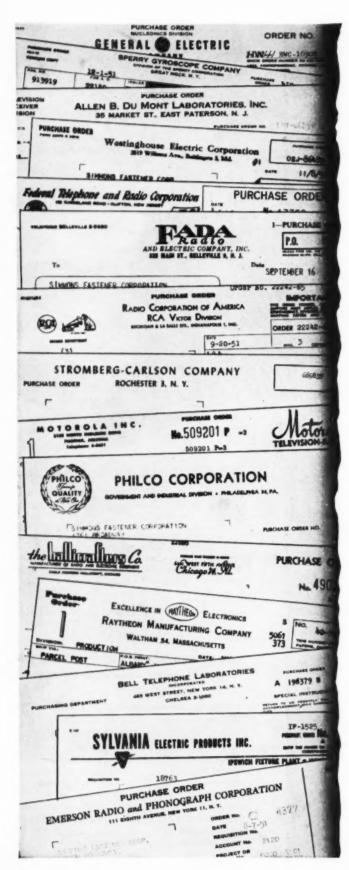
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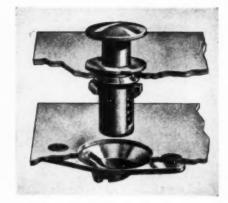
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- Initial loads taken by helical spring. Increased loads carried on solid supports.
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- · Stud is self-ejecting when unlocked.
- Stud is self-aligning. Makes mounting and demounting detachable panels simple.

QUICK-LOCK can help reduce your assembly costs and can add unusual advantages to your designs. Send for data and samples today.

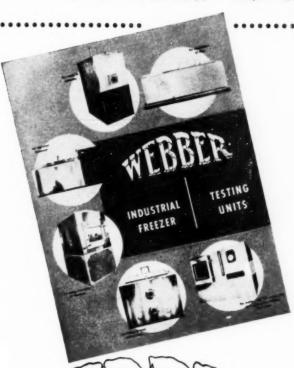
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Simmons

QUICK-LOCK LINK-LOCK SPRING-LOCK ROTO-LOCK

Fasteners that improve products and reduce assembly costs.

For Testing ... For Production Line If It's Low-Temperature Equipment makes it !



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WEBBER manufactures to customer specifications . . . testing units and production line models at no increase in cost. Temperatures range as low as -185° F., and as high as 350° F., on heat cycle. Exclusive WEBBER patented features including stabilizing loops, reverse cycle refrigerating for heating which permits heat application under conditions that otherwise would become hazardous, and WEBBER patented heat exchangers are but a few of the factors responsible for such performance. Humidity and vacuum are offered for testing operations to stimulate atmospheric conditions found anywhere on earth . . . or above it.

Automotive and aircraft plants, atomic energy research laboratories, government agencies, and numerous other large industrial plants have come to look upon WEBBER as a symbol of the finest in dependability, engineering and craftsmanship.

Write today for the free folder illustrated on the left describing WEBBER'S wide variety of engineering skills. If you have low-temperature problems, WEBBER has the answer.

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Mills, Drills, Spotfaces and Taps Bearing Blocks (1200 pieces per hour)

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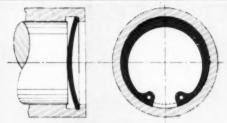
- Drills and spotfaces stud holes; drills angular oil hole; drills and taps two screw holes; mills bearing lock slots; and saws into five individual pieces.
- * 240 bearing block sets (1200 pieces) per hour at 100% efficiency.
- * Capacity for machining two sets of parts at a time.
- * Two heavy-duty, 25 hp, vee belt drive, milling spindles for sawing operations.
- Other features: Built-in chip conveyor, automatic lubrication, overhead transfer mechanism, gravity operated cam clamping for work holding fixtures, J.I.C. hydraulic and electrical construction.

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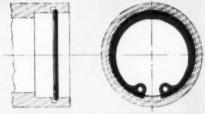
THE STATE OF CO.

Special MACHINE TOOLS

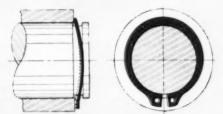
if end-play take-up is a problem one of these special Waldes Truarc rings can solve it



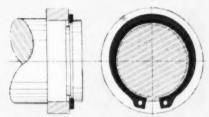
series 5001 · internal type for bare diameters from: .250 - 1.456 in.



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Take up end-play resiliently, damp vibrations and oscillations. Bent like a bow out of plane at horizontal center line. The bowed Truarc ring acts in axial direction like a floating spring without losing its tight grip against the bottom of the groove. Maximum resilient end-play take-up: .015" to .020" depending on size of ring.

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Take up end-play rigidly. When the ring is contracted (or expanded), the tapered edge acts like a wedge moving deeper into the groove and shifting in an axial direction until the ring abuts the machine part.

Maximum end-play take-up, depending on ring size: internal types, .005" to .043"; external types, .005" to .040".

WALDES TRUARC is much more than a better way to hold parts together

Thousands of manufacturers have already found that Truarc Retaining Rings cut production costs and speed assembly by simplifying product design. But that's not all.

Waldes Truarc engineers have extended the use of retaining rings by developing rings that perform additional functions while acting as retaining shoulders. Those

shown here take up end-play, compensate for wear and varying manufacturing tolerances.

No matter what your problem, there's a Waldes Truarc Ring designed specifically to solve it. Send us your drawings, your questions—Waldes Truarc engineers will work with you, at no obligation.



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WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK WALDES TRUBER BETAIRING BIRGS AND PLIERS ARE PROTECTED BY ORE OR MORE OF THE POLLOWING U.S. PATERTS. 1.381.347; 2.381.348; 2.410.811; 2.410.341; 2.410.741; 2



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FOR PRECISION

PRODUCTION . . .

PRECIS-O-NIZING



LD mass production methods are not enough to satisfy a market that is demanding both quality and lower prices.

Only through modern precision-production techniques can a manufacturer hope to use this two-edged sword to his own advantage!

Because of this need for a productive method of generating precision . the Microhoning process was evolved. For a quarter of a century the Micromatic Hone Corporation, working with industry, has led the honing field in the development of equipment that would productively finish parts within the ever-shrinking tolerances of new designs and standards.

This applied precision-adeptness of the Microhoning process is "PRECIS-O-NIZING'

In one economical operation Microhoning abrades stock rapidly and efficiently with a minimum of heat to generate-

- -bores that are round and straight
- -accurate diametric size
- —a functional characterized (cross-hatch pattern) surface finish that is free of smeared or distorted material.

The processing of sewing machine parts is an example of PRECIS-O-NIZING.



Microhoning equipment is available to handle all kinds and sizes af parts . . . from soft non-ferrous metals to hardened steel and special alloys . . . from .078 to 60 inches in diameter and from 1/4 inches to 75 feet in length.

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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MICROMATIC

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614 Empire Building 206 So. Main Street Rockford, Illinois

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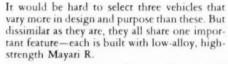
1535 Grande Vista Las Angeles 23, California

REPRESENTATIVES: Overgard Machine Tool Company, 234 Commonwealth Bidg., Denver 2, Colorado Machinery Co., 2726 First Ave., South Seattle, Wash.

REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

They Haul Oil, Machinery and Ice Cream





BETHLEHEM STEEL There seems to be no limit on the types of trucks, trailers and other highway vehicles that can be built better with this versatile steel. In some instances vehicle designers are interested primarily in increasing strength; in some they are interested solely in reducing deadweight without sacrificing strength; in others they aim at a middle course by combining a moderate increase in strength with a corresponding reduction in deadweight. Engineers have their choice when they work with Mayari R.

Another thing that can be counted on with this steel is increased resistance to atmospheric corrosion. Mayari R will resist corrosion damage 5 to 6 times longer than plain carbon steel of equal gage. It will also retain paint up to 80 pct longer, depending upon the composition of the paint used.

Get more information on Mayari R. Take advantage of its properties to improve your present designs. Our Catalog 259 will explain Mayari R features and applications in detail.

BETHLEHEM STEEL COMPANY BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



For any automotive need, gas or diesel, there's an Exide Battery of the right size and type. In automobiles, trucks, tractors, off-the-highway equipment, aircraft, and motor boats-Exide Batteries mean quick, sure starting, year in, year out.

Whatever your battery needs-Exide can answer them. You can be sure of prompt delivery of factory-fresh batteries from one of the many Exide manufacturing and assembly plants. Furthermore, you can count on these great batteries for dependable service, long life, low cost per mile of operation.

This kind of performance has made the Exide name the world's guide to the ultimate in battery value. Constant research-engineering keeps it so.

for light, medium, or heavy-duty service

1888... DEPENDABLE BATTERIES FOR 65 YEARS... 1953

THE ELECTRIC STORAGE BATTERY CO., Philadelphia 2 · Exide Batteries of Canada, Limited, Toronto "EXIDE" Reg. T.M. U.S. Pat. Off.

NOW! South Wind

HEATING SYSTEMS combine these 3 benefits in one heater!



Answers needs of all types of engines, all pre-heating requirements. Heats engine components, battery, crankcase, carburetor with warm, dry air. Makes starting easier, faster—even at 65° below!

personnel heating

Warm air—independent of engine heat, independent of engine operation—circulates swiftly, evenly, to keep personnel comfortable at all times.

windshield defrosting

Keeps windshield reliably "frost-free." Assures clear vision, safer driving.

FIGURES THAT PROVE SOUTH WIND'S SUPERIORITY

Lab Tested . . . Field Tested . . . Best by Every Test!

South Wind's entirely new principle of scientific pre-heating has been developed, tested and proved in the field, as well as in the Stewart-Warner Laboratory Cold Room.

Here is a typical temperature record of critical engine components during pre-heating (only minimum capacity 70,000 BTU/hr. pre-heater kit used). This heat provided adequate temperature rise for easy starting—with less than 5-seconds cranking.

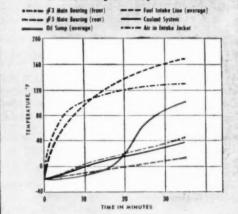
Data is based on a 6-cylinder, 2-cycle, 225 HP Diesel engine, weighing 3,000 pounds.

Compact, powerful, dependable Stewart-Warner
"South Wind" pre-heating systems are first choice
of engineers and maintenance men for these reasons:

- Provides quick starting required by Military Services even at 65° below.
- One heater provides engine starting, cab heating and defrosting.
- 3. Provides only clean, dry hat air to engine.
- Permits use of optimum viscosity lubricants.
- Normal lubrication at all times.

- Lowers engine maintenance cost – prolongs engine life.
- Reduces bottery drain by reducing starting torque.
- Eliminates cost of expensive starting aids.
- Eliminates shock loads imposed by brute force starting methods.
- Inhibits sludge formation and freeze-up of engine accessories.

Temperature vs. Time of Diesel Engine Components



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Do You Have A Heeting Problem? Write today for the experienced counsel of South Wind field engineers about any problem in external or internal pre-heating. The wide range of South Wind Heaters includes 20.000 – 30.000 – 50.000 – 100.000 – 200.000 and 600.000 BTU/hr. capacities. Write South Wind Division. Stewart Warner Corporation. Indianapolis 7, Indiana.

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To avoid trouble with yours,

Call On MALLORY

If your mobile radio equipment is going to operate properly, under all sorts of conditions, the power circuit must be carefully designed. Experienced engineering must go into the design and selection of each element so the vibrator characteristics are in balance with the transformer and buffer capacitor.

These are some of the reasons vibrators can't be selected simply by size and rating alone if you are going to get long, trouble-free performance.

We have worked with leading manufacturers of electronic equipment on their vibrator power supply problems since we introduced the first commercial vibrator over 20 years ago. Our experience includes supplying more vibrators for original equipment than all other makes combined.

To avoid vibrator power supply troubles...call on Mallory in the design stage. Our engineers are thoroughly qualified by experience to study your specifications to be sure the power circuit will give maximum performance.

Our engineers will be glad to discuss your vibrator power supply problems. Write or call us today.

Expect more...Get more from MALLORY



In addition to supplying vibrators, Mallory is equipped to design and manufacture complete power supply units . . . to your exact requirements . . . to meet your production schedules.

Parts distributors in all major cities stock Mallory standard components for your convenience

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ly submerged. Can be operated in this position at about 9 miles per hour. Made by Willys Overland Motors, Inc., Toledo, Ohio, for the Armed Forces.



Illustrated are two of the many types of capacitors and filters made by Aerovox Corporation, New Bedford, Mass,; an important capacitor supplier to both Electric Auto-Lite and Glenn L. Martin. The unit above is the filter capacitor used in the generator regulator of the submersible jeep while the unit at the right is used in the pilotless bomber.

Generator regulator for the 24-volt system of the submersible Jeep. This is com-pletely waterproof and highly resistant to corrosion and fungi. Produced by The Electric Auto-Lite Company, Toledo, Ohio.



CALL REVERE

The dramatic pictures on this page show two important special applications of Aerovox capacitors. One is the Martin B-61 Matador pilotless bomber. It contains an Aerovox capacitor, which has to withstand the terrific acceleration and speed of the craft. The other is the submersible Jeep. Its 24-volt electrical system is completely waterproofed, and includes Aerovox filters and capacitors for suppression of radio interference. Revere not only supplied copper and brass strip for the capacitor cases, but collaborated closely in setting up specifications, and in addition worked on a welding problem. In regard to the latter, an Aerovox Project Engineer wrote: We have had much better welds." . . . Revere is always glad to collaborate on problems concerning copper and its alloys, aluminum alloys, and electric welded steel tube. Call the nearest Revere Sales Office.

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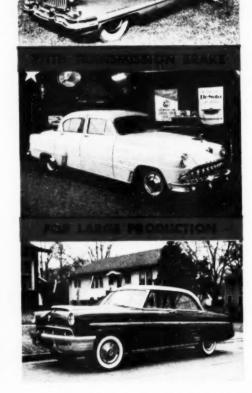
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MATERIALS HANDLING EQUIPMENT

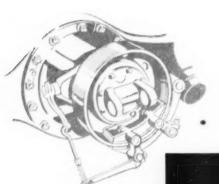
*Registered Trade Mark

Yale & Towne Manufacturing Company, Philadelphia 15, Pa.

• Just as the Ford Motor Company's slogan is "Ford's Out Front!", so, too, Ford is out front when it comes to maintaining a high degree of efficiency in its manufacturing operations. In keeping with this slogan and with the exacting demands made on all operating equipment in the plant, Ford has specified YALE Electric Trucks as one of the production tools for the mammoth new Ford foundry located in Cleveland, Ohio.

When the Ford Motor Company chose Yale trucks, they knew that it would result in lightening the burden of workers ... hasten output... and cut down on operating costs! It is this kind of confidence in the endurance and reliability of Yale trucks as shown by Ford—in common with other leading manufacturers—that leads users of materials handling equipment, from giant Ram Trucks to compact Worksavers, to rely on dependable Yale industrial Lift Trucks and Hoists.

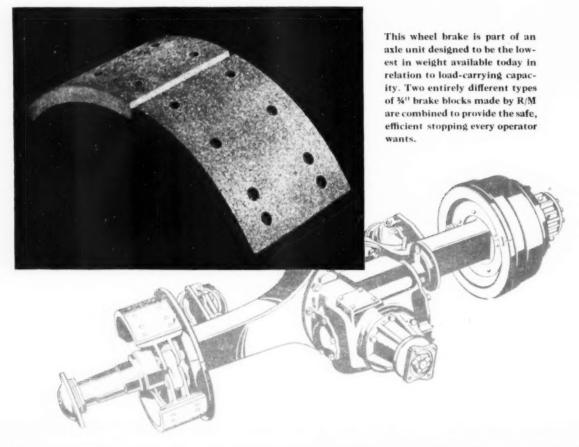
Gas, Electric, Diesel Lift Trucks • Worksavers • Hand Trucks • Hand and Electric Hoists • Pul-Lifts





This handbrake is a marvel of mechanical simplicity. It gives maximum efficiency with minimum maintenance. The two opposing brake shoes are lined with an R/M high friction lining, M-2761, and an R/M low friction lining, M-2541. The combination means dependability over a long period of time.



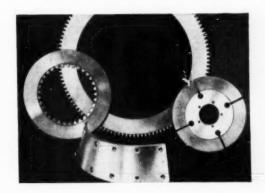


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The need for sintered metal parts is on the increase, especially where applications call for close tolerances or operating conditions require immersion in oil. R/M's production is keeping pace with industry's need for these parts.

Write for your copy of the R/M Engineering Bulletin. It describes and illustrates many R/M friction materials for aviation, agriculture, the automotive industry and others.

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WORK CYCLE AUTOMATICALLY CONTROLLED—no time loss between loading and unloading work piece.

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Accurate—doubly reinforced frame foundation, precision-cut flame hardened steel cams—sustain close tolerances at fastest feeds and highest speeds modern carbide cutting tools can take.

Easy to Operate—compact, free from gadgets one man runs 2 machines or more, depending on cycle time of job.

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Twist! Turn! Perform!

Mechanical flexibility means job flexibility in the new Wagner "Dozermobile" made by Mixermobile Manufacturers, Portland, Oregon.

Its unique principle of hinging two power axle elements together by a hydraulically controlled steering coupling provides outstanding maneuverability and stability. Actually, the "Dozermobile" glides over the roughest terrain—all four wheels are always on the ground.

Features include planetary drive, calculated 18,000-lb. drawbar pull, 75% gradeability, perfect operator visibility, 16 mile an hour highway speed.

Another Advanced Product Equipped

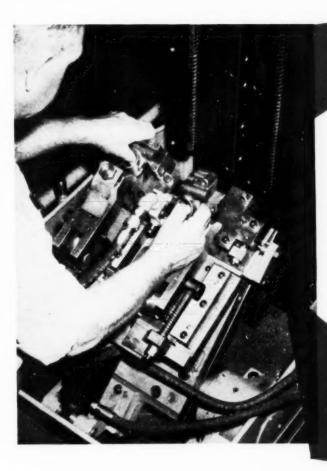
The driving mechanisms of Mixermobile Manufacturers' various pieces of construction equipment are equipped with BBP Ball Bearings—a selection based on proved performance, plus the help of BBP Field Engineers.

Industry knows ADDEP Bearings for their high radial capacity plus their ability to carry substantial thrust load. Industry knows ADDEP, too, for more than just bearings—the plus advantage of reliable design advice from ADDEP's field and home office engineers.

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AUTOMATICALLY TILTS,
CLAMPS PARTS for
GENERATING TYPE
BROACHING

Speeds production of parking brake brackets designed and built the American way

Two parallel surfaces on each of two parts are straddle broached in one pass on this American SB-42-10 single ram broaching machine. Over 350 of these intricate parking brake brackets are completed every hour.

The complete tooling designed the American Way features:

- 1. Generating type broaches.
- 2. Fully automatic work holding fixture with tilting table.
- 3. Automatic clamping and unclamping of parts.

The operator simply loads and unloads the parts, starting each machine cycle by push button control.

For the answer to your broaching problem send a part-print or sample and hourly requirements to American . . . the organization that gives you the extra advantages of experience in producing all three . . . broaches, machines and fixtures. No obligation. Address Dept I.

For more information on the American SB-42-10 and other American machines, write for Circular #300.

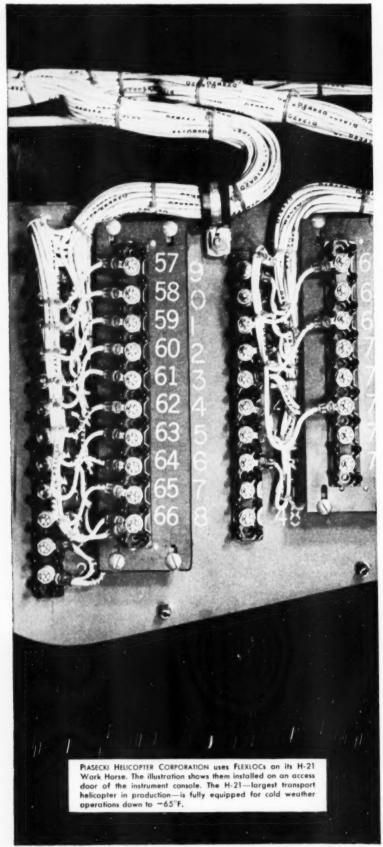


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Why use FLEXLOC locknuts?

The answer is simple. They hold assemblies together, and won't work loose like ordinary nuts. Once you install these one piece, all metal nuts, you can forget them. Yet they can be easily removed and can be reused again and again.

No fastening job is too tough for a FLEXLOC. Whether it's on an access door of a Piasecki Helicopter or the picker stick of a high speed loom, a FLEXLOC stays put.

FLEXLOCS save production and maintenance time. They are one piece, all metal—nothing to assemble, come apart, lose or forget. Standard FLEXLOCS have higher tensile than most other nuts—and because they are all metal, are not affected by temperatures to 550°F.

SPS can deliver any quantity of FLEXLOCS in a wide range of sizes. Stocks are carried by industrial distributors. Write for literature and samples. SPS, Jenkintown 53, Pa.



LOCKNUT DIVISION

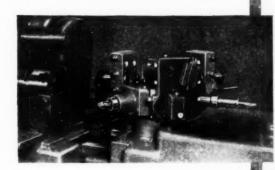


Our Fifteeth Gene : A START FOR THE FUTURE

NOT CLAIMS…

ACTUAL FACTS!

17 Operations in 1.85 Minutes





FIRST TURRET FACE

- 1 Spot Drill Hole
- 2 Rough bore 1.125" counterbore

SECOND TURRET FACE

- 3 Core drill hole through
- 4 Machine two pads at front of hole
- 5 Rough face end at rim
- 6 Rough face and form turn 6.126" diameter

THIRD TURRET FACE

7 Break corners at core in center of hole (Slide Tool)

FOURTH TURRET FACE

- 8 Finish bore hole
- 9 Finish bore 1.125" diameter
- 10 Counterbore and form bevel at bottom
- 11 Finish turn 6.126" diameter
- 12 Finish face end
- 13 Finish face shoulder

FIFTH TURRET FACE

15 Ream hole .6245" diameter

SIXTH TURRET FACE

- 16 Ream counterbore 1.125" diameter
- 17 Size turn 6.126" diameter

SURFACES MACHINED ARE INDICATED BY HEAVY LINES

3 U SPEED-FLEX Automatic Turret Lathe PLUS P&J TOOLING



Machining this cast iron motor bracket in just 1.85 minutes isn't a special record run for a 3U Speed-Flex, but another example of the fast, accurate work you can expect day in and day out from a P & J Automatic plus P & J Tooling on almost any job requiring a high output of small, precision parts.

Check your present equipment; if it can't match this performance, you're missing big opportunities for lower unit costs, divided labor costs — and a better all 'round profit and production picture.

Find out more about production the P & J way. Send today for your copy of the P & J 3U Bulletin No. 145 — or ask experienced P & J Tool Engineers to submit tooling recommendations based on your own prints or sample parts.



Sign up



NOW Stopping
IS AS EASY AS accelerating



It is no langer necessary to lift the foot and exert leg power pressure to bring your can be a stopp. With the Bendix Law Pedal Power Drake on about the same level as the accelerator, on easy ankle movement, much like working the accelerator, in all the physical effort required for braking. And by merely piveting the foot on the heef, shifts from "go" to "stop" controls are made in for less time.

Result: MORE DRIVING COMPORT, LESS

Car manufacturers, here is a sure answer to the problem of creating added interest in your line of cars. Equip your vehicles with Bendix* Low Pedal Power Brake, the sales feature that has already established itself as one of

the most popular devices offered the public in years.

Dealers are enthusiastic because with the Bendix Low Pedal Power Brake it is now easy to demonstrate added braking power and safety. Service managers are happy because of its trouble-free performance and, best of all, new car buyers realize that with today's trend toward "power" operation, a car equipped with a Bendix Low Pedal Power Brake offers the ultimate in braking efficiency.

Remember, too, this new low pedal power brake is the product of Bendix, world's largest producer of power brakes and leader in braking developments since the earliest days of the industry. That's why if you are contemplating power braking it will pay to "Sign Up" with Bendix for the greatest improvement in braking since four wheel brakes.

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High Spots of This Issue

Fisher T-48 Tank Plant Fully Conveyorized

Except for more floor space, advanced machines, and the latest materials handling systems, it's just like World War II times again at the Fisher plant in Grand Blanc, Mich. Now, however, the T-48 tank dominates the scene. See Page 48.

* Automotive Uses Featured at Plastics Conference

Attention-getters at the recent Reinforced Plastics Conference in Washington, D. C., were automotive products, including aircraft components. Included in this review are a discussion of the exhibits and abstracts from papers. Page 52.

★ U. S. Turnpike Expansion a Factor in Truck Design?

The Ohio Turnpike will soon join the Pa. and N. J. ones in aiding the flow of cross-state traffic. As these high-spect roads continue to grow, it is logical to expect that trucks will be built designed to capitalize on them. See Page 56.

* Connecting Rod and Piston Automation

Automation, now one of the most valued industrial production techniques, has been extended to piston and connecting rod machining at the Ford Cleveland Engine Plant. The author describes several of the devices used for automaticity. Page 64.

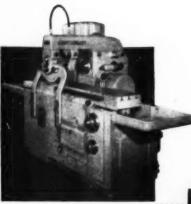
★ Making a Wide Variety of Motor Vehicle Parts

Versatile indeed are the operations of the Atwood Vacuum Machine Co. plant in Rockford, Ill. Now a prime supplier of stampings and fabricated assemblies to the automotive industries, its facilities and products are outlined. Page 70.

★ 19 New Product Items And Other High Spots, Such As:

> Gemmer power steering gear simplified and improved; bus of knockdown type developed in France; Armstrong-Siddeley Sapphire engine; axle shafts machined on special automatics; chassis suspension system incorporates weight indicator; and SAE meeting highlights.

Automotive and Aviation News, Page 33 Complete Table of Contents, Page 3



Plain style, new CINCINNATI No. 2-24 Automatic

Milling Machine



new

new/



Plain Rise and Fall style, new CINCINNATI No. 2-24 Automatic Milling Machine

new

... the cincinnati no. 2-24

You can always look to Cincinnati Milling for the finest in machine tools. Cincinnati's newest is the No. 2-24 Automatic, an outstanding example of fine engineering and workmanship, combining advanced production features and easier, more convenient means of setting up the job. There are three styles: Plain, Duplex, and Plain Rise and Fall. All have two-way table feed cycles with cycle selector control; automatic backlash eliminator; automatic spindle stop; Dynapoise overarm. You may obtain complete information by writing for 28-page catalog No. M-1760. Brief data in Sweet's Catalog File.

THE CINCINNATI MILLING MACHINE CO.
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TEWS of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 108, No. 7

April 1, 1953

GM Sets Prewar Share of Market As Goal

A determined effort this year to recapture its pre-war share of the market, something it has been unable to do in the post-war period, will be made by General Motors Corp. according to Harlow H. Curtice, president. At a testimonial dinner given in connection with the Chicago Automobile Show he said that General Motors had designed an aggressive program to raise total market penetration to 48 per cent of all cars sold from the 41.2 per cent it has achieved during the last two years under federal controls.

Schedules for the first half of this year have been increased at least 50 per cent over the same period a year ago and if achieved will mean slightly more production than was attained in the same period of 1950. The company also, as one phase of its program to aid and strengthen its dealers, will set up a system of 35 service training centers throughout the country to provide permanent facilities for training mechanics and other dealer personnel.

General Motors expects its sales volume this year to be the highest on record approaching \$9 billion of which 20 per cent will be represented by defense products. Mr. Curtice also reported that the corporation has spent more than \$21/2 million for new plants, tools and facilities since the end of World War II, representing an expenditure equivalent to % of total net profit during that period. He also revealed that the Technical Center currently being built just outside Detroit represents an investment of more than \$100 million, the first time the cost has been divulged.

Air Conditioning Seen for Tenth of New Cars

Within the next decade 10 per cent of all new cars built will be equipped



HARDTOP SPORT NASH

The Nash-Healey LeMans hardtop sports car will be available in limited quantity in addition to the 1953 convertible model. Shown at the Chicago show last month, the new Farina-designed body will be built in Italy. Mechanically similar to the convertible, the closed car weighs 2970 lb., will sell for over \$6400.

with air conditioning, according to P. J. Kent, Chrysler Corp. executive engineer. He told the SAE National Passenger Car, Body, and Materials meeting in Detroit that only 10,000 cars have been equipped with air conditioning in the past 15 years, with most installations built and installed locally. He said the introduction of factory-installed cooling equipment will broaden the market materially for air conditioners.

Record Crowd Attends Chicago Auto Show

Chicago automobile dealers nailed down their previous claim of having the largest and most complete auto show in the country again this year. Attendance broke all previous records, totaling more than 500,000 visitors.

Officials say that they have no ambitions to make their exposition the national automobile show. They point out that national shows started when it was necessary to attract financial interest for a company and to get dealer representation but that the

need now is strictly for a selling show. There is little doubt that the Chicago show rivals previous national shows in scope and breadth of interest. Not only are all passenger car manufacturers represented with their new models but many lines of trucks also participate in addition to parts and accessories exhibits. Beyond that several companies exhibited special experimental and sports models and set up elaborate engineering displays.

The Chicago Show also goes in heavily for showmanship, with elaborate stage presentations of new models interspersed with high caliber entertainment. Nonetheless, it is basically a local selling show and is considered highly successful in that respect.

Ford Sees 51/4 Million Car Year as Average

Over the next 10 years motor vehicle producers should build and sell about 5.25 million passenger cars and 1.38 million trucks, according to T. J. O'Neil, director of production sales and dealer organization planning for Ford. He adds, however, that this could be a conservative estimate.

Trews of the AUTOMOTIVE



PACKAGE POWER

The Fairchild J-44 turbojet engine develops about 1000 lb thrust, weighs 300 lb. With its own accessory section containing electrical starting and oil storage, it requires no oil cooler, external oil lines or pump. Cantelever design allows the unit to be supported from the forward end only. It powers the Ryan Q-2 target plane.

L-M, Packard Show Production Boosts

Lincoln-Mercury Div. of Ford Motor Co. plans to practically double its production shortly, Richard E. Krafve, assistant general manager, announced last month.

The division's assembly plant at St. Louis added a second shift operation Mar. 30 and the plant at Metuchen, N. J., started a second shift recently. A sizable increase in the daily output of cars at the new assembly plant in Wayne, Mich., through a second shift has been scheduled for the immediate future, Mr. Krafve said.

The second shift will increase production at St. Louis by more than one-third, with a combined total of 640 cars a day compared to the present rate of 480 cars a day on one-shift operations. At Metuchen, production will be stepped up to a combined total of 448 cars a day from the two shifts. Currently production has been 350 units per 10-hr day. Production at the Wayne plant is expected to be more than doubled, increasing its present 224 cars a day to 480 a day.

An enthusiastic progress report on doings at Packard Motor Car Co. was presented to a press gathering in Detroit on the eve of the Chicago show by president James J. Nance. The new merchandising program initiated late last year is ahead of schedule both in actual production and in public acceptance with the Clipper program exceeding expecta-

Employment of hourly rated workers, due to the accelerated program, is up to 20,000 compared with only 9000 postwar. Production is running at a rate of 600 cars per day, two-thirds of this being Clippers. However, with the increased tempo for the industry, Packard's share is being upped to 135,000 units for the year. This is contrasted with 62,000 units sold by the company in 1952. Packard has scheduled immediate production of 1000 of its Caribbean sport models for this year, claims that orders for these already are on hand.

The new merchandising program is being pushed energetically with new dealers being signed up at the rate of about 50 per month. Packard now has 1600 dealers on the books, the goal being 1800.

Snyder, Thomas Slated for Chrysler Board

Two new nominees for directors of Chrysler Corp. will be submitted to stockholders at the annual meeting Apr. 21. They are Carl J. Snyder, vice-president and operating manager, and C. B. Thomas, Chrysler vice-president and president of Chrysler Export Corp. If elected, they will succeed Herman L. Weckler, vice-president and general manager, and Carl Breer, engineering consultant, both of whom are retiring as directors.

Studebaker 1952 Sales Hit Peak

Although Studebaker produced about 19 per cent fewer passenger cars and trucks last year than in 1951 because of materials restrictions, defense work showed a sharp increase so that sales hit an all-time high. According to the company's financial statement for 1952, income from sales and other sources totaled more than \$586.1 million as compared to \$504 million the previous year, or an increase of 16 per cent. Net income also showed an increase from 1951 totaling more than \$14.2 million, an increase of 13 per cent over the previous year. Earnings did not set a record, however, having been exceeded in 1948, 1949 and 1950. Last year military sales accounted for about 36 per cent of the company's total business. Production of military trucks will end sometime this year but output of jet aircraft engines will be substantially higher than it was last year. The company expects to build about 350,000 cars and trucks this year, which would be a record for Studebaker and exceed 1952 production by 65 per cent. Last year Studebaker produced 231,-837 units.

Aircraft Industry Nears Peak Rate

The aircraft industry expects to hit its peak production and employment rate under the limited emergency program within the next ten months. By the end of this year employment is expected to hit 800,000, which is considerably below the World War II peak of 1.25 million in 1943. Payrolls this year, however, will total about \$3.3 billion, matching the wartime peak with only two-thirds as many employes.

Chrysler Defense Orders

Chrysler Corp. has been awarded \$155 million worth of additional defense contracts. Largest of the three new contracts is one for tank guns totaling more than \$105 million. Another order for spare parts amounts to \$43.6 million and a third for engineering services totals more than \$7.2 million.

AND AVIATION INDUSTRIES

Use Tank Plant for Automatic Drives

Ford Motor Co. will convert its tank plant near Detroit to production of automatic transmissions when its defense contract there is completed late this year. The plant will add to, rather than replace, automatic transmission production facilities already operating at Cincinnati, where an expansion previously had been planned. Production schedules at Cincinnati and at Borg-Warner Corp., which supplies part of Ford's needs, will be increased.

Chrysler-Cunningham Wins Sebring Test

The Chrysler-powered Cunningham roadster narrowly squeezed out first place in the Sebring (Fla.) Grand Prix of Endurance on Mar. 8. A British Aston-Martin was second in the 12-hr race, followed by three Jaguars.

Winning average speed was 74.9 mph over the winding 5.2-mile circuit. Top speeds of over 130 mph were reached on the 1500-yd straightaway.

Displacements were 183 cu in. for the Aston-Martin, 210 cu in. for the Jaguar, and 331 cu in. for the Chrysler-Cunningham.

Tool and Die Workers Get Higher Pensions

As a result of voluntary reopening of a five-year contract between member companies of the Automotive Tool and Die Manufacturers Association and two UAW-CIO Locals, pensions for 10,000 employes in the Detroit tool and die industry will be increased as much as \$35 a month. Under the new agreement, maximum pensions now range up to \$135 a month after 25 years service at age 65 or older, including social security benefits. Other changes include provision for early retirement with the minimum years service reduced from 25 to 10, an increase of \$30 a month and a decrease in minimum years service to 15 for permanent disability, and a \$500 death benefit payable to the beneficiary of retired employes.



FORMAL PACKARD RETURNS

Custom eight-passenger limousine and sedan and six-passenger formal sedan are now in production after 15 years. On 149-in, wheelbase, the larger cars are said to be sold out in advance. Prices for these models start at \$7095, \$6895, and \$6771 respectively; equipment is extra except for Ultramatic on formal sedan.

Makers Aid Dealers

The automobile industry is well aware that merchandising of used cars may well prove the key to continued high new car sales this year. It is reconized as an important problem and all companies are actively promoting merchandising programs for their dealers. Oldsmobile has started an intensive series of used car merchandising conferences. The program will include 94 two-day conference meetings conducted by five two-man teams of marketing experts from the General Motors Institute at Flint. Packard also has 22 training schools going, with emphasis on used car merchandising.

GM 1952 Sales Hit Peak; Net Below '50 and '49

Although General Motors Corp. sales last year exceeded the previous all-time high set in 1950 by \$18 million, net earnings were third highest on record. Net income in 1952 amounted to \$559 million, representing a return of 7.4 per cent on sales of \$7.549 billion. This compares with earnings of \$506 million on sales of \$7.466 billion for a 6.8 per cent return in 1951. Highest earnings year on record was 1950 when net income was more than \$834 million on sales exceeding \$7.531 billion.

GM points out that income last year was increased by including \$30 million

of deferred earnings on Canadian operations earned in previous years, by elimination of a \$35 million defense emergency conversion and tooling item which was in the 1951 budget, and by a larger proportion of defense sales last year. The breakdown on sales shows \$6.097 billion in civilian products and \$1.452 billion in defense items, compared with \$6.705 billion and \$761 million, respectively, the previous year.

Total taxes paid by General Motors on its operations last year mounted to \$1.107 billion, including \$943 million in federal and foreign income taxes and \$964 million in state, local, and social security taxes. The corporation's excess profit taxes last year totaled \$158 million. In addition, sales and excise taxes collected by GM on its products totalled \$472 million, bringing the total tax figure for the year to \$1.579 million, or about 4½ times the amount paid in dividends on common stock.

General Motors spent \$629 million last year for real estate, plants, and equipment including special tools. Only half the expenditure came from depreciation reserves, with the balance coming from earnings and by depletion of working capital. The latter item declined \$266 million during the year. Since the end of 1945 GM has expended about \$2.5 billion for improvement and expansion of plants and facilities.

Trus of the AUTOMOTIVE



FOUR-SEATER

The Moretti 600 series introduced in Italy last year has become popular. The four-cyl ohv engine gives 23 hp at 4250 rpm.

Ford Remodels Rotunda for 50th Anniversary

Its famous Rotunda at Dearborn will be reopened to the public about the first of June as part of the company's 50th anniversary observance, Ford Motor Co. has announced. The building, which was built for the Chicago World's Fair in 1934 and later moved to Dearborn, has been completely remodeled. Up to about a year ago it had been used by Ford as an office building and since that time has been undergoing renovation, including animated displays, sculptures, murals, and dioramas depicting how science and manufacturing skills convert raw materials into finished products and advance standards of living. Other displays and exhibits have been fashioned to show the contribution of basic industries to the production of automobiles.

Novel Muffler

Considerable interest was aroused in industry circles when Buick announced the adoption of a muffler system free from power loss. Improvements were made to reduce restriction in the system. The tubes which carry gases through the muffler are carefully rounded for easy gas flow. Moreover, the gas tubes in these mufflers are believed to be the largest used in the industry.

The entrance tube to the muffler also is unique. Not only is it considered to be the largest used in the industry but it is formed with a patented reverse taper. The outlet end is ½ in. larger in diameter than the inlet end, in venturi fashion. This taper serves the dual function of slowing down the velocity of the exhaust gas and at the same time con-

verting the velocity head into a pressure head which is used to force the gas through the muffler. The tailpipe used on the Buick V-8 is 2½-in. in diameter, the largest ever used by the company.

Worker Shortage

The labor problem is becoming acute with recruiting of new workers from various parts of the country again in evidence to meet the needs of all-out vehicle production plus defense work. General Motors has started to hire women in considerable numbers, a practice it had abandoned following the peak days of World War II.

Rules Changed for Economy Run

The 1953 Mobilgas Economy Run sponsored by General Petroleum Corp. will be held Apr. 20-22, 1953. The course will again be from Los Angeles to Sun Valley, Ida., a distance of more than 1000 miles. Principal change this year is the reduction in the number of competing classes of cars. Last year there were 11 classes for the standard, fourdoor, stock cars, including two special lightweight divisions. By contrast, this year, there are four price classes -low, low - medium, upper - medium and high-and one special lightweight classification.

All competing cars in the high price class will be equipped with automatic transmissions, while in lower price divisions cars will be permitted to compete with either standard (including overdrive) or automatic transmission.

This year's Economy Run is again sanctioned and supervised by the AAA. The event is limited to 1953 stock-model passenger cars of U. S. manufacture for price class and sweepstakes awards based on mileage performance.

1953 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the January, 1953 Total

				Per Cent	of Total
MAKE	January 1953	December 1952	January 1952	January 1963	January 1952
Ford	76,617	80,172	39,815	19.85	13.22
Chevrolet	69,933	76,084	66,790	18.11	22.17
Plymouth	47,002	52,064	40.378	12.17	13.41
Pontias	26,845	22,769	22,382	6.95	7.42
Buick	26,102	23,991	23,498	6.76	7.80
Dodge	21,604	23.529	16.367	5.59	5.43
Mercury	19.831	22.573	12.299	5.13	4.08
Oldamobile	18,798	17,255	15.831	4.87	5.25
Nash	12.763	12,801	8.993	3.30	2.98
Studebaker	11.704	15.803	14,879	3.03	4.94
Chrysler	11,702	11,366	9.524	3.03	3.16
De Soto	9.356	10,151	6.599	2.42	2.19
Cadillac	8.118	4.777	4.473	2.10	1.48
Packard	6.450	6.149	4,409	1.67	1.46
Hudsen	5,316	5.683	5.099	1.38	1.69
Willya	4.416	3.858	1.752	1.14	.58
Lincoln	2.929	2.890	942	. 76	.31
Kaiser	2,621	3.506	2.808	. 68	.93
Henry J	1.302	1.792	2.326	.34	.77
MG (British)	583	573	367	.15	.12
Ford (British)	467	352	305	.12	.10
Jaquar (British)	384	386	183	.09	.06
Hillman (British)	363	377	274	.09	.09
Austin (British)	342	322	406	.09	.13
Attetato	66	90	80	.02	.02
Misc. Domestic	85	74	309	.02	.10
Viac. Foreign	542	519	331	.14	.11
•			331		
Total All Makes	386,221	399,906	301,379	100.00	100.00

AND AVIATION INDUSTRIES

Used Cars Support New Car Market

Used cars comprise the base for a healthy new car market which will average 5 to 6 million units a year over the next few years, according to W. F. Hufstader, General Motors vicepresident. He says that of 38 million cars in use today 16 million, or 44 per cent, are classified as new cars with 22 million, or 56 per cent of the total, representing used cars.

He adds that if the used car population increases to from 17 to 18 million and levels off at that figure it will support a 5 to 6 million new car market annually. By 1961, he predicts, the traditional pre-war ratio of one-third new cars to two-thirds used will prevail in the automobile population and that the used car owner group will total about 35 million. On this basis total car ownership by that time would be 52½ million.

Mr. Hufstader also says that the normal pre-war depreciation rate of two per cent a month from the time of sale on new cars had not yet been reached in the post war period, and that last year General Motors dealers showed a gross profit on used car operations. Since the end of the war, he adds, dealers have been wholesaling used cars at twice the normal rate.

Ford Revives Plans for New Office Building

Plans to build a new 12-story administration building at Dearborn to house its central staff offices have been revived by Ford Motor Co. Originally the project had been planned for 1950 but was deferred when the Korean war started. Plans for the building have been modified considerably since that time in line with changes in the company's office space requirements. The building will be 532 ft long, 84 ft wide, 190 ft high, and will provide approximately 640,000 sq ft of floor space. It will be air-conditioned throughout and have movable interior partitions to provide maximum flexibility of arrangement. It is on a 120 acre site and will be occupied by about 3000 employes. A three-story attached building will provide employes cafeteria and dining rooms and other services, including enclosed parking facil-



Somerville Made V.P. of Sales for Dodge

In a reorganization of the top level sales staff at Dodge Div. of Chrysler Corp., R. C. Somerville, formerly vice-president and a member of the board of Plymouth Div., will assume the post of vice-president in charge of sales and a member of the board. At the same time, L. F. Desmond, previously sales manager of passenger cars, has been named general sales manager to

succeed E. C. Dock, who has resigned to take an automobile dealership. In his new post Mr. Somerville will have full responsibility for all the sales activities for Dodge passenger cars and trucks.

Magnaflux Moves

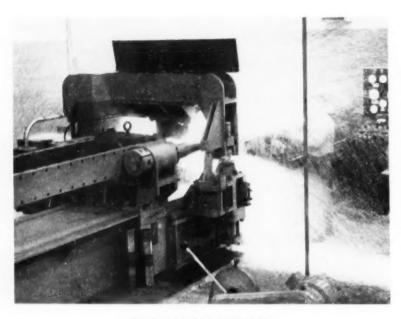
The plant and general offices of Magnaflux Corp. have been moved to 7300 W. Lawrence Ave., Chicago 31, Ill., to enlarged facilities.

REGIONAL SALES OF NEW PASSENGER CARS

					Per Cen	t Change
Zone	Region New England	January 1953 20.350	December 1952 20,341	January 1952 15,877	January over December	January over January 1962
2	Middle Atlantic	60.865	81,715	52,132	+ .04 -25.52	+28.17
2	South Atlantic	48,705	48.298			+ 14.84
4	East North Central	101,709	102.674	42,412 74.837	+ .84 94	+35.91
5	East South Central	19.232	18.942	14.882	+ 1.53	+29.23
6	West North Central	32,169	33,878	32.385	- 5.04	67
7	West South Central	44,158	33.367	29.535	+32.34	+49.51
8	Mountain	13.082	13.400	8.955	- 2.37	+46.09
9	Pacific	45,951	47,291	30.364	- 2.83	+ 51.33
	Total United States	386.221	399.906	301.379	- 3.42	+28.15

States comprising the various regions are — Zone 1; Conn., Me., Mass., N. H., R. 1., Vt. — Zone 2; N. J., N. Y., Pa.,—Zone 3; Del, D. of C., Fla, Ga., Md., N. C., S. C. Va., W. Va., Zone 4; Id., Ind., Mich., Obio, Wis.,—Zone 5; Ala, Ky., Miss., Tenn., Zone 6; Iossa, Kan., Minn., Mo., N. D., S. D., Zone 7; Vrk., La., Okta., Tex.,—Zone 8; Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo., Zone 9; Cal., Ore, Wash.

Mews of the AUTOMOTIVE



NEW CONTACT WELDER

Dauglass Aircraft Co. is testing this Taylor-Winfield 800-kva flashwelder it specified to handle bars and tubes of steel, titanium or other metals with joining areas of 12 sq in., up to 12 ft long. Clamping force is 40 tons. It will weld landing gear parts and strust for C-124 Globemaster and later for the RB-66 bomber.

Thompson Buys Holley Plant in Michigan

Thompson Products, Inc., has purchased the Portland, Mich, plant owned by Holley Carburetor Co. and vacant since last fall when the operation there was moved to Kentucky. The 70,500 sq ft plant is located on a 91 acre site and will bring to three the number of Thompson Products plants in Michigan. It will be called the Portland Works and used for production of tie rods, drag links, truck bearing housings, tractor steering parts, and machine socket assem-

blies. Plans call for eventual transfer of all truck and tractor parts operations from the Detroit plant to the Portland Works in order to make room for new passenger car parts business.

Trailer Coach Sales Rise

Sales of trailer coach mobile homes totaled an all-time record \$319.9 million during 1952, according to the annual report of the Trailer Coach Manufacturers Association. This was an increase of more than 28 per cent over 1951. Unit sales of 83,054 mobile homes were up 25 per cent.

January, 1953, Retail Car Sales Valued at \$820,000,000

	Si	iles	Dollar Volume		
Price Group Under \$2,000 \$2,001 to \$2,500	Units† 206,341 104,994	% of Total 53.81 27.38	Dollars \$372,549,696 233,905,958	% of Total 45.41 28.51	
\$2,001 to \$2,500 \$2,501 to \$3,500 Over \$3,500	54.352 17.786	14.17 4.64	147,329,929 66,585,534	17.96 8.12	
Total	383.473	100.00	\$820.371.117	100.00	

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment. 1—New registrations of American mode care only. Does not include imported foreign care.

Electric Auto-Lite Building New Plant

Electric Auto-Lite Co. has started construction of a \$2 million plant at Toledo. It will comprise more than 225,000 sq ft of area and adjoins one of the company's present plants, of which Auto-Lite will have seven in Toledo when the new plant is completed. Cost of equipment and the nature of products to be produced are confidential since the plant will be devoted largely to military work.

FMC Buys Tool Firm

Food Machinery and Chemical Corp. has acquired the Milwaukee Equipment Manufacturing Co., producer of rotary tillage equipment. The newly acquired company will be operated as a subsidiary of Food Machinery and as an affiliate of the corporation's Bolens Products Div. which produces garden tractors and power lawn mowers at Port Washington, Wisc.

New Ryerson Plant

Joseph T. Ryerson & Son, Inc., announced that construction had begun on a completely new and much larger steel service plant for the firm's operations in Milwaukee, Wisc.

Property at S, 84th St, and the Milwaukee railroad is the site of the new building which will replace the present plant from which the company has been doing business since 1925.

The new steel service plant, which will consist of two large building units and an office building, will have approximately 166,000 sq ft of floor space which is about three times the present plant capacity. The plant will be heated, to preserve and protect the finish of special quality steels.

Much new equipment for cutting and handling steel will be installed, including a powerful high speed friction saw for cutting structural steel shapes, an electric eye machine for flame cutting heavy steel plate, and new plate shearing equipment. The new plant is scheduled for completion early in 1954. The plant will carry larger and more diversified stocks of carbon, alloy and stainless.

AND AVIATION INDUSTRIES



MAKES BARS FOR DETROIT

A 50,000-sq-ft plant has been opened by Bliss & Laughlin, Inc., for production of cold finished bars, both in carbon and alloy steels. Located at Eight Mile and Hoover Rds., Detroit, the new facility is the fourth B&L plant.

Engine Deposits Made Radioactive

A new research technique for studying deposits in engines was announced last month in a paper delivered by Dr. H. P. Landerl and Dr. B. M. Sturgis, of the Du Pont Co. before the American Chemical Society.

The new procedure involves the use of motor fuel containing radioactive tetraethyl lead. The location and distribution of the radioactive lead salts which this additive deposits within the combustion chamber can be detected later by means of x-ray film. This new technique makes it possible to observe the formation and removal of deposits during a relatively short time at any stage of the deposit growth. It is now possible to determine where the deposits are forming at any stage of their development, it was explained.

Federal-Mogul Net Shows Small Drop

Federal-Mogul Corp. reports a three per cent drop in sales for 1952 from the previous year to slightly more than \$35 million. Net earnings also declined to more than \$2.734 million compared with \$2.915 million in 1951. Taxes, however, also showed a decrease totaling \$3.3 million last year compared with \$5.845 million in 1951.

Bliss & Laughlin Opens New Plant at Detroit

Bliss & Laughlin, Inc., soon will start production of cold drawn steel bars in a new plant at Detroit. The new plant is the first unit of a series of four scheduled for the Detroit site and contains about 50,000 sq ft of space. It is located on a 12-acre tract at the northern edge of Detroit and will cost about \$1.5 million for the plant and equipment. Initially bar stock up to three in. maximum diameter will be produced. Bliss & Laughlin, one of the largest non-integrated producers of cold drawn steel products, chose the Detroit location because of its proximity to automotive customers. Main plant is at Harvey, Ill., with branches at Buffalo, N. Y., and Mansfield, Mass.

Perfection Develops New Truck Heater

Perfection Stove Co. has developed a new type automotive heater designed for use on trucks, tractors, or automobiles in subzero areas. Principal use of the heater, which has a 60,000 BTU capacity, is for vehicles operating in regions with temperatures down to 60F below zero. It can be mounted under the hood or between the radiator and grille and can

be made either completely automatic for thermostatically controlled heating or may be operated manually. It burns gasoline, kerosene, or No. 1 fuel oil and is equipped with electric ignition and electrically-powered blower. It measures 8 by 11 by 24 in. and sells for less than \$200. It warms the engine coolant, cab, and even the cargo of semi-trailers.

1953 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the January, 1953 Total

				Per Cent	of Total
MAKE	January 1953	December 1952	January 1952	Januar y 1953	January 1952
Chevrolet	25,174	25,675	19,455	34.67	32.61
Ford.	18,328	16,990	12,986	25.24	21.77
nternational	7.737	6.295	6.650	10.66	11.15
Dodge	7,655	7.684	7.979	10.54	13.37
3. M. C.	7.068	6.514	5.969	9.73	10.00
itudebaker	2,210	2.194	2.114	3.04	3.54
Willys Truck	1.038	1,110	897	1.43	1.50
Willys Jeep	826	967	581	1.14	.97
White	780	652	977	1.07	1.64
Mack	490	517	536	.67	.90
leo	283	253	239	. 40	.40
Diamond T	247	227	288	.34	.48
Brockway	154	177	117	.21	. 20
Diveo	149	166	254	.21	. 43
ederal	127	81	52	.17	.09
Autocar	95	140	142	.13	.24
Kenworth	52	40	47	. 07	. 08
Pontiac	42	41	74	.06	.12
F. W. D	38	38	76	.05	. 13
Peterbilt	21	10	19	. 03	. 03
Misc. Domestic	60	154	189	.08	. 32
Miac. Foreign	32	24	20	. 94	.03
Total-All Makes	72,606	89,949	59,661	100.00	100.00

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers



Dodge Div., Chrysler Carp.—Edward H. Rice is now truck sales supervisor.

Budd Co.—Samuel C. Horst recently was appointed chief estimator.

Pontiac Motor Div.—Three promotions raised Myron L. Leighton to general superintendent of the afternoon shift, Lawrence Olk to assembly plant superintendent, and Jerry E. Dunnigan to assistant superintendent.



Detroit Stamping Co.—William H. Roberts was elected vice-president and secretary, succeeding John Beck and H. G. Roberts who have been semi-active in these capacities recently.

Borg-Warner Corp.—In a major reorganization, L. G. Porter, treasurer, is now administrative vice-president and treasurer; R. S. Ingersoll, president of Ingersoll Products Div., is now also administrative vice-president of the parent corporation; and Robert W. Murphy, general counsel, is also a vice-president.





Ainsworth Mfg. Corp. — Charles W. Weiler, Jr., was appointed assistant secretary and Frank Komerska was named Detroit plant manager.

Evans Products Co.—Oscar A. Pratt and F. H. Harl have joined the company as production control manager and superintendent of main plant production, respectively.



Hyster Co.—William M. Campbell has been named manager of the Peoria, Ill., division.

Consolidated Engineering Corp.— Hugh F. Colvin has been promoted to vice-president and treasurer. Peter J. Totino is now chief process planner.

Mack Trucks, Inc. — Albert G. Crockett is now in charge of public relations. K. L. Fitts is manager of off-highway truck sales.

Goodyear Tire & Rubber Co.—Robert C. Case recently became chief engineer of the tire design division.

Pontiac Motor Div.—George A. Delaney, chief engineer, was elected to the board of the American Standards Association, as nominee of the SAE.

Titeflex, Inc. — Recent promotions raised Henry S. Elder to executive vice-president, George K. Licht to vice-president in charge of production, and John J. Phillips to vice-president in charge of sales and engineering.



ACF - Brill Motors Co.—Capt. S. J. Zeigler, USN (Ret.), has been appointed development manager of research and development.

Houdaille-Hershey Corp. — Charles C. Conley fills the new position of supervisor of research.

A. Schrader's Son, Div. of Scoville Mfg. Co.—John Hoerger has retired as Pacific Coast manager. Richard C. Maxwell is now Los Angeles manager, and Clarence M. Huffman is Pacific Coast manager of accessory sales.

Trailmobile, Inc.—Arthur W. Lang was named manager of the new Dayton, O., factory branch.

Timken Roller Bearing Co.—Richard K. McConkey was promoted to assistant general manager of the Industrial Div. recently.

Piasecki Helicopter Corp.—William Davey was raised to director of manufacturing following the resignation of Ernest Wenigman as vice-president of manufacturing. Neal L. Stetson was promoted to production manager.





Carboloy Dept.—Vernon H. Dearle will retire June 1 as manager of the Michigan sales district. Lt. Col. Peter J. Jensen has returned as manager after a tour of duty with the Ordnance Corps.

Nash Motors Div.—R R. Compton, former zone manager, succeeds N. F. Lawler as central division manager. Lawler has joined Geyer Advertising, Inc.

Bendix Aviation Corp.—Election of Lawrence A. Hyland as vice-president in charge of engineering has been announced.

American Brake Shoe Co.—John F. Ducey, Jr., is now vice-president; George E. Anne is assistant vice-president, and Daniel J. Wagner is district sales manager of the Brake Shoe and Castings Div.

Steel Products Engineering Co.— Delmond L. Getz has been elected vice-president for engineering.

AUTOMOTIVE INDUSTRIES, April 1, 1953

National Advisory Committee for Aeronautics — Five Caltech faculty members appointed to the committee include Profs. Clark B. Millikan, Hans W. Liepmann, Frank E. Marble, Ernest E. Sechler, and Dr. A. J. Stosick.

Clearing Machine Corp.—Gordon M. Summers recently was named chief engineer of the Hamilton, O., plant.



Standard Products
Co. — Donald G.
Wright, formerly with
Chrysler, has joined
the firm as assistant
to the president.

Flxible Co.—New titles of eastern and western sales managers were given to Harold E. Hilty and Joe F. Gettrust.

Ryan Aeronautical Co.—Curis L. Bates, formerly with Northrop, has joined Ryan as assistant director of engineering.



Goodyear Tire & Rubber Co. — R. B. Warren has been named manager of the industrial products departments.

Engineering Div., Chrysler Corp.— Ira E. Johnson was named general manager, Arnold Steckling chief engineer and assistant to the general manager, and Wallace E. Zierer supervising experimental engineer of the proving grounds.

Aircraft Industries Association—George H. Buchner, of Northrop Aircraft, has been elected chairman of the spare parts committee. John B. Clark, also of Northrop, has been elected chairman of the industrial relations committee.

Consolidated Vultee Aircraft Corp.

Goldon Wolcott is now manager of the Dayton, O., office.

North American Aviation, Inc.— L. S. Wait is now assistant to the vice-president.

Carboloy Dept. of General Electric Co.—Orville B. Lefko has become supervisor of marketing budgets and forecasting. Yale Materials Handling Div. of Yale & Towne Mfg. Co.—Carieton P. Adams is advertising manager and Newcombe C. Baker, Jr., is manager, special sales promotion.

Clark & Bobertz, Inc. — Appointment of Alex P. Golden as director of the public relations and publicity department has been revealed.



Houdaille - Hershey Corp.—Frank G. Fisher has been promoted to general manager, and remains vice-president.

U. S. Steel Corp. — George I. Reynolds, Jr., recently became assistant director of market development.





Briggs Mfg. Co. — Election of George W. Drysdale, vice-president in charge of manufacturing, to the board has been announced.

General Electric Co., Aero & Ordnance Systems Div.—Heads of two new operations are Dr. Richard W. Porter, guided missiles dept., and Fred. B. Law, aircraft products dept.

Scintilla Magneto Div. of Bendix Aviation Corp. — Appointment of Thomas Z. Fagan as director of sales and service and William A. Uline as general sales manager have been announced.

Pump Div., Eaton Mfg. Co.—W. Ross Eames was named assistant to the general manager, Louis A. Selin is assistant sales manager, Nicholas A. Noreyko is assistant chief engineer, and Richard H. Berge is assistant plant manager.

Cessna Aircraft Co.—Del Roskam recently was promoted to vice-president-manufacturing.

Lear, Inc.—T. K. Greenlee was appointed chief electro-mechanical engineer of a new department in the Grand Rapids, Mich., plant.





AC Spark Plug Div. — Bruce H. Schwarze, left above, is now assistant chief engineer, automotive and defense products. Martin J. Caserio, right, is now resident assistant chief engineer under Schwarze. Donald F. Ayres, below left,





succeeds Schwarze at Milwaukee as resident assistant chief engineer, defense products. John E. Schultz moves up to administrative engineer in charge of the research and development section, succeeding Ayres.

Wagner Electric Corp.—W. B. Mc-Millan succeeds Charles B. Fox, who died recently, as director.

Necrology

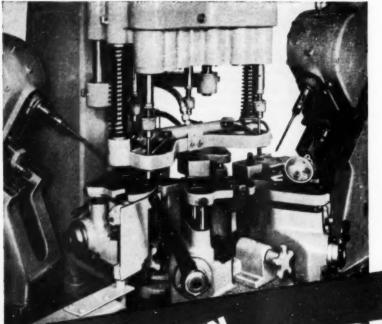
Marc Birkigt, 76, founder and chief engineer of Hispano-Suisa Co., died in Geneva, Switerland, on Mar. 15.

George D. Wilson, 69, early car body builder lately representative for Howell Electric Motor Co., died at Detroit on Mar. 3.

John M. Clark, 69, retired vice - president of Purolator Products, Inc., died at Miami Beach, Fla., on Mar. 5.

Stanley H. Swarthout, chief process engineer at Delco Appliance Div. of General Motors Corp., died Mar. 6 at Rochester, N. Y.

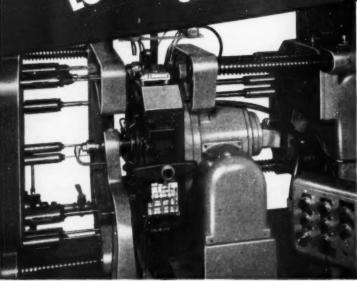
Richard Knight LeBlond, 88, founder and chairman of R. K. LeBlond Machine Tool Co., died Mar. 17 at his home in Cincinatti, O.





Closeup at the left shows a six station Hartford Automatic single purpose machine rough and finish reaming two cored holes, plus drilling two holes at different angles in die cast aluminum housings.

The LOWDOWN HIGH PRODUCTION





This view shows a four station Hartford vertical dial type machine drilling, coredrilling and counterboring five holes in aluminum valve bodies.

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When it comes to production .

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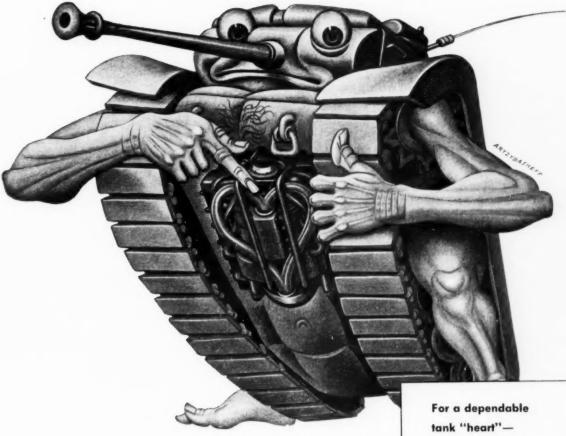


Automatic THREAD ROLLERS



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THE HARTFORD SPECIAL MACHINERY CO., HARTFORD 12, CONN.



New "ticker" for tanks

Rumbling over rugged terrain . . . crushing enemy obstacles ... surviving heavy fire-our "G I." tanks must have powerful, dependable engines to stay "alive" in combat. That's why the Army Ordnance Corps relies on Lycoming to turn out air-cooled "tickers" for new-type tanks now in production.

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AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES . PRECISION-AND-VOLUME MACHINE PARTS . GRAY-IRON CASTINGS . STEEL-PLATE FABRICATION

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500 horsepower's worth of rugged air-cooled engine-U. S. Army Ordnance looks to Lycoming's precision production.



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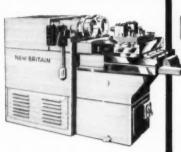
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New Britain Builds the . . .

CAM OPERATED Boring Machine



Cam actuation reproduces tolerances and finishes with absolute certainty piece after piece, hour after hour, day after day.





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A NEW BOOKLET...

"BAKELITE Polyester Resins for Reinforced Plastics"

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Reinforced plastics made with BAKELITE Polyester Resins are introducing new concepts of structure and design to industry. They are remarkably easy to fabricate, requiring little or no pressure. They are light in weight, with a high strength-weight ratio. They can be given almost unlimited color, and have excellent light-transmission characteristics. The superior electrical properties of polyester resins are well suited to the production of electrical and electronic components where stringent dielectric specifications must be met.

This booklet, available to you without cost, describes the several BAKELITE Polyester Resins developed for reinforced plastics—gives the facts about their preparation, properties,

processing, and use.

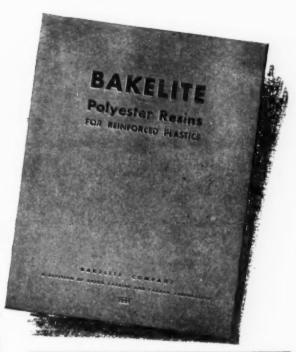
For instance, Owens-Corning "Fiberglas" cloth was laminated with one type of BAKELITE Polyester Resin—BRSQ-193—plus 10% monomeric styrene. The resulting reinforced plastic, tested at standard conditions under USAF specification MIL-R-7575, showed these characteristics:

All of these values exceed the requirements of the specification. Yet, the specific gravity of this reinforced plastic, which contains about 36 to 38 per cent resin, is only 1.8.

These thermosetting materials are especially useful when strong, lightweight, large-scale moldings are called for. Boats, oil storage tanks, machine housings, furniture, radomes, plane cowlings, arctic sleds, and body armor are examples of their successful applications.

Designers and engineers will want to know more about Bakelite Polyester Resins for reinforced plastics. Send for your copy of this booklet now!

City	State
Street	
Company	A MA CANCEL ME MARKET ME
Name	Title
Please send me, without cost or "Bakelite Polyester Resins for I	obligation, a copy of booklet L-10. Reinforced Plastics."
Bakelite Company, Dept. PQ-5 A Division of Union Carbide and 30 East 42nd Street, New York 1	Carbon Corporation



Here are some of the features covered in this booklet:

PROPERTY TABLE

FORMULATION

Blends Additives Fillers
Catalysts Accelerators Colorants
Thinners and Solvents

COMPOUNDING

Resin Mixing Working Life

REINFORCING MATERIALS

PRODUCTION METHODS

Diaphragm Molding Rubber Plug Molding Match Metal Die Molding Casting Production Equipment

RELEASE AGENTS

FABRICATION

Machining Cementing

BAKELITE

POLYESTER RESINS



BAKELITE COMPANY

A Division of
Union Carbide and Carbon Corporation

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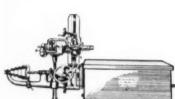
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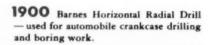
at W. F. & JOHN BARNES

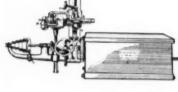
Presented here are a few of the milestones in machine tool building which, over the years, have helped industries achieve the goal of producing more and more goods for more and more people at a lower cost. In effect, the application of these early Barnes Machines trace the technological advancement in machining methods. With this background, we are today better able to serve your current and future needs.

1872 Foot-Powered Scroll Saw - the first Barnes-built industrial machine.

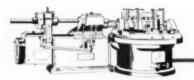


1885 Open Frame Single Spindle Drill Press - belt-driven and hand feed.





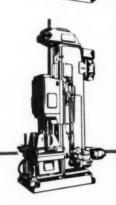
1920 Single Purpose 20" Barnes Production Gang Driller.



1925 Barnes Single Head Screw Feed Boring Machine - equipped with rotating table.

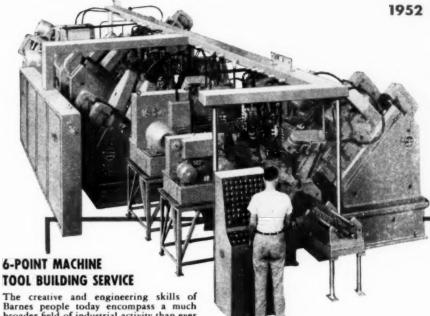


1930 Barnes Special Vertical Single Point Boring and Reaming Machine equipped with hydraulic feed unit.



SPINDLE DRILLING . BORING . TAPPING MACHINES MULTIPLE

in Machine Tool Building



One of the latest Barnes Automatic 13-Station Progress-Thru Machines for drilling, reaming, chamfering and tapping V-8 automobile engine cylinder heads. Machine is equipped with 82 spindles and handles 78 machining operations at a gross production rate of 125 pieces per hour.

(Below) An Automatic Retort Loading Machine is one of a variety of special equipment, such as glass handling machines, can unloaders, carton uncasers and special conveyors designed and currently built at Barnes for food, chemical and beverage industries.

Barnes people today encompass a much broader field of industrial activity than ever before in the company's 80-year history. A broad 6-Point Machine Tool Building Service is provided by experienced me-chanical, hydraulic, electrical, process, tool and fixture engineers working together toward a common goal. As a result, you get the benefit of a coordinated effort that saves time and trouble.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES . . .

- P SPECIALIZED MANUFACTURING FACILITIES

 —80 year background, large well equipped plant
 efficiently tooled to produce high production
- 2 SPECIAL HYDRAULIC EQUIPMENT-and built to meet JIC standards. In engineered units assure amooth, d actuation for every requirement.
- 3 SPECIAL GAGGES, FIXTURES, TOOLS—di signed for each individual machining problem assure accuracy of operation at high production
- 4 SPECIAL ELECTRICAL EQUIPMENT and CONTROLS—individually designed and built for maximum safety and ease of control with circuist that assure the most dependable coordination of
- 5 SPECIAL HANDLING AND CONVEYOR EQUIPMENT—designed and built to reduce work handling, effect maximum safety and efficiency.
- 6 COORDINATED DESIGN AND ENGINEER-ING—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work legether at Barnes. Team-work solves complex problems

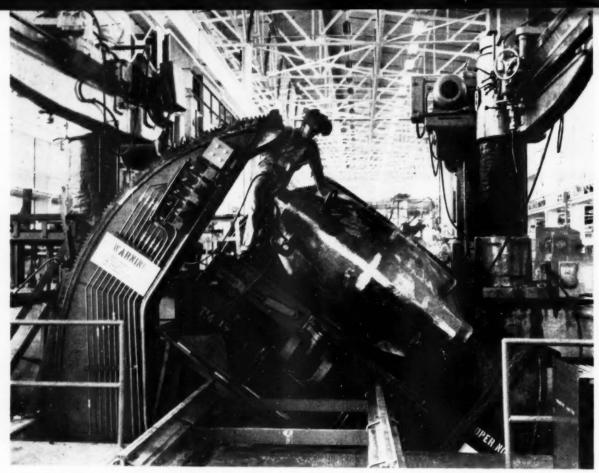
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Ask for free booklet "Coordi-nated Machine Engineering" describing the scope of Barnes machine tool building service. Illustrates and describes modern machines and mass production techniques.



WATER STREET, ROCKFORD, ILLINOIS

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



Enormous power-driven fixtures, such as the one seen here, are designed for rolling an entire tank hull into any required regular position to facilitate a variety of operations. At the right may be seen one of several Cincinnati-Bickford radial drills mounted about this fixture for drilling of odd holes. Some repair welding also can be handled as shown in this view.

Fisher T-48 Tank Plant Fully Conveyorized

HISHER Body Div., GMC, is once again building tanks in the Fisher Body Tank plant at Grand Blanc, Mich. It will be recalled that this enormous plant was built in WW II for Fisher tank production; and for some time between the end of the war and Korea was operated by the Buick Motor Division as a warehouse for parts and as a national service center.

Now Fisher is delivering T-48 medium tanks, giants weighing some 49 tons. In converting the plant back to tank production for the new model, it was necessary to

add more floor space and at this writing the building encompasses about 1,200,000 sq ft of productive floor space under one roof.

In its original conception by the Ordnance Department the T-48 had a one-piece casting of armor plate for the enormous hull. This required only a moderate amount of welding. Since then it was found expedient

> to make a composite hull composed of a number of individual armor plate castings. While this change simplified foundry problems materially, it brought with it a tre-

By Joseph Geschelin

mendous increase in welding operations, requiring considerably more floor space, more welding fixtures and equipment, and a bigger crew of skilled welders who are trained at the plant.

Fisher engineers have designed some huge framing fixtures, bearing a technical similarity to body framing jigs, in which the sections of the hull are brought together and fitted accurately for welding into an integral unit. Because of the size and weight of the hull, welding positioners are bigger than those generally used in the metalworking industry. When production is going full blast, the plant will have in operation about 600 arc welders of 400-amp capacity. Some of these are Westinghouse units, others were supplied by Hobart, and Lincoln Electric

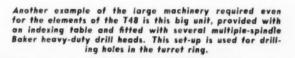
Apart from the tremendous activity in the welding departments, machining operations on the hull, turret, and turret ring sections constitute the major part of operations before the tank reaches final assembly. The metal cutting equipment required for these operations includes some of the largest and most massive machine tools known to the metalworking art. Scope of machining operations may be best appreciated by looking at the sampling of illustrations reproduced here.

Along one bay are the two major machine lines for the hull, running about 280 ft. As illustrated, one of the lines is really a huge transfer machine in which the various

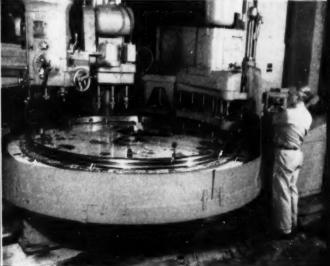


Requirements of non-destructive testing are beginning to tax the limits of the larger commercial X-Ray equipment. At Grand Blanc they use this 2-million-volt General Electric X-Ray equipment for exploring the soundness of thick armor plate castings.

This out-sized Fellows gear shaper cuts the 300 gear teeth in the turret ring section.



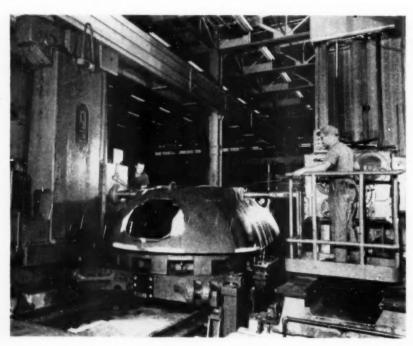




AUTOMOTIVE INDUSTRIES, April 1, 1953



Versatile craneways in the plant are useful in the handling and transportation of heavy tank parts, fixtures, etc. In this view one of the hulls is being hoisted into position for loading onto a trailer.



makes and types of machine tools are arranged about a floor conveyor system. The hull is moved progressively from station to station but remains locked in place at each station during the machining stage. Along this line are found stations fitted with Morton milling heads, Mercury grinding heads, Ingersoll, Niles and Gray boring mills and milling machines.

Another section of this long machine line is composed of individual stations at which the hull is held in a fixture in the usual manner, installed vertically or horizontally depending upon the location of operations. Typical of such stations is the Niles boring mill setup in which three big Niles mills are arranged about the central fixture.

Enormous Niles mills, of 16-ft capacity are found in a large battery, one example illustrated here showing the turning of turret ring bores in the big turret casting.

Some of the biggest radial drills known to the art have been installed on the hull machine line. One of the arrangements, illustrated here, shows the setup for drilling odd holes in various locations about the hull casting. The hull is mounted in the huge turnover fixture to facilitate angular movement of the work. About this fixture are installed two or three, as the case may be,

of the large Cincinnati-Bickford radial drills. The same setup also is employed for repair operations—both drilling and welding.

Unique radial drill arrangement is found in a similar installation which boasts several Kaukana units with universal drill heads. These are veritable giants capable of drilling in any angular position.

One of the major machine lines is devoted to the manufacture of turret ring sections. Some impression of the kind of equipment used in this department may be gained from the illustration of the Baker multiple drill

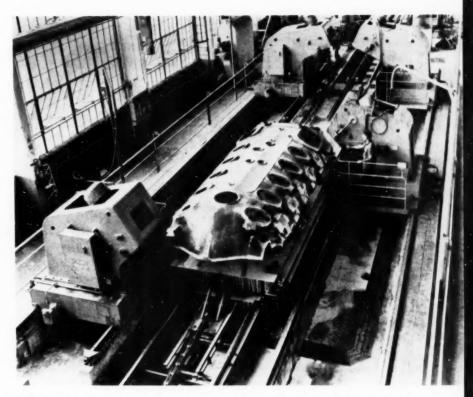
On the long conveyorized machine line—big turret castings in the process of being bored in this Niles station. Both sides are horizontally bored at the same time. setup for drilling holes in the turret ring. As shown, this station is fitted with two large Baker drill heads, each one having six spindles.

Easily one of the largest gear cutting jobs to be found in any plant is the internal gear for the turret ring. This is done with a Fellows gear shaper. Some impressions of the size of this job may be gained from the fact that this gear has 300 teeth.

Cutting operations on armor plate involve unusually heavy chip removal performed at relatively low rates. It poses a difficult job for cutting tools from the standpoint of tool life. Up to the present time most of the heavy metal cutting operations have been handled with high-speed-steel

tools, using cutting fluids. More recently, some of the tooling has been switched to cemented-carbides, cutting dry, and eventually it is expected that most cutting tools such as milling cutters and single-point lathe tools will be tipped with cemented-carbides.

To give some idea of the magnitude of metal removal, we give below two specific examples, chosen at random. For example, the facing of the turret casting, in a Niles mill, is done with a single-point Castaloy tool $1\frac{1}{2}$ in. wide. Cutting is done at a surface speed



Hull structure moving along the enormous transfer machine line. At this station the series of pads on each side are ground to size by means of Mercury grinding heads which are arranged to traverse while work is held stationary.

of 90 fpm, average depth of cut being 0.040 in.
One of the heavy milling operations employs a
14-in. HSS face mill. Cutter speed is 10 rpm, feed is
three ipm. Depth of cut is one-in., producing an enormous chip considering the nature of the material.

From the standpoint of materials handling it is noteworthy that the entire plant is traversed by heavy craneways, mainly of 20-ton capacity, for transporting the heavy parts into and out of machines and assembly operations.

Ford, GM Suggestion Plans Paid Record Awards

Awards paid by Ford Motor Co, to employes under its suggestion system were the highest last year since the plan went into effect in 1947. In 1952 the company paid out \$456,399 to bring the total since 1947 to \$1.46 million. Acceptable suggestions last year totaled 39,759, an increase of 40 per cent over the year before. The total number of suggestions earning awards up to \$1500 each in 1952 was 9527, considerably ahead of the 7358 award winners in 1951. Nearly 16

per cent of the company's employes participated in the program last year compared with 13.5 per cent the previous year.

General Motors Corp. reports that its employe suggestion plan established 11 years ago continues to grow in favor with its workers. Four new records were established last year, according to Harry W. Anderson, vice-president in charge of personnel staff. Total number of suggestions submitted last year was 144,890, an increase of more than 4000 over 1951. Suggestions accepted also reached a

new high, totaling 33,863, compared with 30,758 the year before. Total awards last year paid for suggestions also were at a new peak, totaling more than \$1.678 million and exceeding the \$1.516 million paid out in 1951.

In addition, the percentage of employes participating in any one year was highest on record in 1952 with 64,909 workers turning in one or more suggestions. In the 11 years that the program has been operating, a total of 9,232,540 has been paid for 217,013 suggestions which were adopted out of a total of 944,778 submitted.

Automotive Uses Featured at Reinforced

AUTOMOTIVE products, including aircraft components played a major role at the Reinforced Plastics Conference of the Society of the Plastics Industry held in Washington, D. C. recently. Not only was the exhibit of this meeting filled to capacity, but the technical sessions were filled to overflowing proportions by the 1420 registrants.

Exhibited during the three day event were two passenger cars with all-plastic bodies, a reinforced plastic chrome plated bumper for a high-production passenger car, radomes, ducting for aircraft, guided missile parts, honeycomb and sandwich material for aircraft construction, a plastic detachable top for an MG car, plastic gages used for checking automobile bodies during assembly operations, and numerous other automotive items of reinforced plastic materials.

One of the passenger cars had a Henry J chassis with a custom-built reinforced plastic body made by a molder in Reading, Pa. The other car was the recently-announced Kaiser-Frazer plastic sports car which is scheduled to go into production at an early date.

A noteworthy development was disclosed in the field of reinforced plastics for aircraft by Zenith Plastics Co., Gardena, Calif., the molders, and Bakelite Co., the resin maker. This new development is a phenolic type resin, to be used in conjunction with glass fiber, which is being used in reinforced plastic materials for making aircraft structural parts, and according to the molder, all-plastic airframes can be produced with the material, see Fig. 1. One of the major military advantages, in addition to the conservation of critical materials, in using all-plastic fuselages for supersonic jets and guided missiles is that plastic materials cannot be detected by radar.

It was stated by William E. Braham, chief engineer of Zenith, that elevated temperatures have less effect upon Fiberglas cloth treated with the new Bakelite resins than on light metal alloys. He further claimed that the new material can be used in aircraft structures operating at temperatures above 300 F with a definite weight advantage.

While practically all sections of the plastics industry experienced market and production expansion in 1952, one group—the reinforced plastics division—enjoyed a production increase of approximately 40 per cent, it was announced by SPI officials at the meeting. Ap-

Plastic Helicopter Research By K. Telford Marshall, Transportation Research & Development Station, Transportation Corps, Ft. Eustis, Virginia

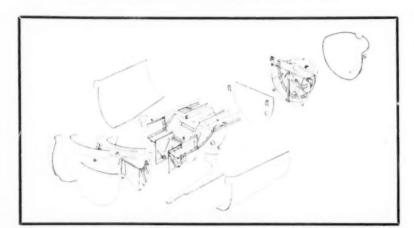


Fig. 1—Assembly diagram of lower fuselage section of XH-26 helicopter constructed of metal.

The Air Division of the Transportation Research and Development Station recently made a thorough study of plastic materials in an effort to evaluate a method for improving Army helicopters. Particular emphasis was given to replacing metals with plastics in parts, components and assemblies. Saving of weight by the use of reinforced plastics presented a way of alleviating the present cargo-range limitations of helicopters. Use of plastics also lessens the demand for critical aircraft metals, eliminates some production problems and lowers production costs.

For example, Fig. 1 shows the lower fuselage section—metal designed—of the American Helicopter Company's XH-26 helicopter. The proposed plastic design of the same section is shown

Plastics Conference

proximately 19 million lb of polyester resins for reinforced plastic products were sold in 1952. Prospects this year indicate a probable market for another 40 per cent increase up to the 27 million lb figure.

Subjects discussed at the interesting technical sessions covered standards of reinforced plastics, molding processes and equipment, finishes, fillers, and the use of reinforced plastics in transportation equipment. Forums were also held which covered new resins and fibrous reinforcements. The resins were discussed by technical personnel from American Cyanamid Co. (Laminac), Ciba Co. (Redux K-6), Warnken Engineering & Mfg. Co. (CTL-91-LD), General Electric Co. (a series of polyester resins, a heat resistant phenolic resin, and a rubber phenolic resin varnish), Interchemical Corp. (335 inhibitor and new polyesters), Marco Chemicals Inc. (new Marco resins), Monsanto Chemical Co. (polyesters), U. S. Rubber Co. (Vibrin resins), Pittsburgh Plate Glass Co. (Selectron resins), Libbey, Owens, Ford Glass Co. (Plaskon resins), Rohm and Haas Co. (Paraplex P-47 and P-49), and Shell Chemical Corp. (Epon resins).

Presented herewith are extracts of five of the many

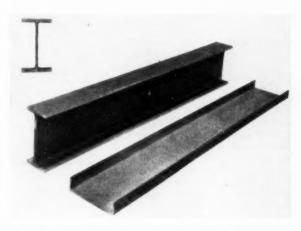


Fig. 1—These channel and I sections are of the type regularly used in wing and tail spars of most aircraft structures. They were made with reinforced plastics consisting of a new plastic resin developed by Bakelite Co.

excellent papers presented at the SPI conference which pertain quite specifically to the automotive field.

in Fig. 2. Where the metal design had 28 major parts to be assembled, the use of reinforced plastic reduced the number to eight. Including the cost of the plastic molds, the time to

teach the fabricators and neglecting the cost of tooling for the metal production, a saving in production costs can be accomplished when more than ten sections are produced.

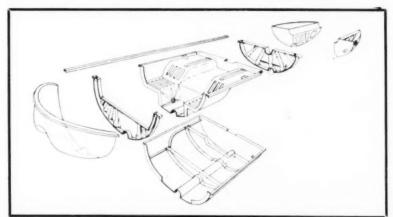


Fig. 2—Diagram of plastic designed parts for lower fuselage of XH-26 helicopter.

High Temperature

By William E. Braham, Chief Engineer, Zenith Plastics Co.

At the present time, practically all aircraft and guided missiles operate at subsonic speeds. Exceptions are relatively small missiles and a few research aircraft which operate for short periods of time. Until recently, most aircraft have been designed to operate within a temperature range of from 65 below zero to 150 F., which is the extreme range of known atmospheric temperatures. These tempera-

ture limitations covered operations in any part of the world from sea level to altitudes of approximately 50,000 ft. Now that aircraft and guided missiles are being designed and built to operate in sonic and supersonic speed ranges, they will be subjected to much higher temperatures. These higher temperatures are a result of the ram compression temperature rise caused by the aircraft's speed. This rise comes from a transformation of some of the kinetic energy of the aircraft into heat energy, and it has been found to be directly proportional to the square of the air velocity. Thus, if the speed of the airplane is doubled, the ram temperature rise is increased four times.

The speed of sound at sea level is 760 mph. At 30,000 ft, it is 675 mph. The ram temperature rise for these speeds is from 70 to 90 F., and adds directly to the atmospheric temperature. For an airplane or guided missile flying near sea level at 760 mph, it is possible to attain a temperature of about 190 F. on portions of its external surfaces. At 1300 mph, it is possible to exceed 300 F., and at 2600 mph, the temperature might be over 1000 F. An example of this is the V-2 rocket, which was developed and used during the last war. German scientists recorded temperatures of

TABLE |
COMPARISON OF TENSILE STRENGTH AT ELEVATED
TEMPERATURES

					Tensile Strength (1000 psi)				
		Reom	Temp.	250	F.	400	F.	500	F.
	Specific	F	F	F	F t	F	F t	F	F t
	Gravity	1		1		1		t	-
Material	(S. G.)	1.0	S. G.	8.8	S. G.	10	S. G.	u	S. G.
1 181-114 Fiberglas Polyester Resin	1.77	49.0	27.7	9.8	5.5				***
3 181-111 Fiherglas BV-17085 Resin	1.80	47.5	26.4	37.0	20.6	27.2	15.1	15.1	8.6
3 181-111 Fiberglas BVQ-11946 Resin	1.80	51.5	28.7	46.4	25.9	42.1	23.5	35.3	19.6
1 143-114 Fiberglas Polyster Resin	1.85	89.5	47.8	17.9	9.6	11.77	****		400
4 143-114 Fiberglas BV-17085 Resin	1.80	86.5	48.0						4000
3 143-114 Fiberglas BVQ-11946 Resin	1.80	72.0	40.0	55.2	30.6	32.0	17.8	16.9	9.4
6 181-114 Fiberglas Epon-1001-									
Plyophen-5015	1.90	55.0	29.0	58.1	26.5				
5 24ST3 Aluminum Alclad	2.80	65.0	23.2	57.8	20.7	39.6	14.1	25.2	9.0
5 75ST6 Aluminum Alclad	2.80	74.0	26.4	66.8	23.8	18.7	6.7	12.5	4.5
5 302-1/2 H Stainless Steel	7.90	150.0	19.0	141.0	17.9	135.0	17.1	132.0	16.7
7 ZK-60A Magnesium	1.80	52.0	28.9	31.8	17.6	15.5	8.6	6.1	3.4
8 RC-130A Titanium Alloy	4.70	150.0	31.9	129.0	27.5	117.0	24.8	112.0	23.8

1500 F. on the surface of the rocket during many flight test programs. Elevated temperatures have less effect upon glass fibers impregnated with phenolic resins than on light metal alloys, or glass fibers which have been impregnated with poyester or epoxide resins. This is shown in Table I. It is evident that the phenolics could be used in an aircraft structure operating above 300 with definite weight advantages.

TABLE 1-A

FORMULATION AND PROPERTIES OF POLYESTER-GLASS FILLED MOLDING COMPOUND

	010	Fire Resistant	Low Cost General Purpose	Fire Resistant
Formulation:	General Purposa	General Purpose	General Purpose	Low Cost
Medium Viscosity Polyester	18.5%		16.4%	
Partially Reacted Polyester, Higher Viscosity	18.5%	18.5%	18.4%	16.4%
Polyester +5% Sb:0:	10.0%	18.5%		16.4%
1/2 Unopped Glass	18.5%	18.5%	8.2%	8.2%
GIAV FILLEY	AA MIL	44.5%	59.0%	59.0%
Catalyst (on resin only)	1.0%	1.0%	1.0%	1.0%
Properties: Compression Molded Specimens:				
Mold Shrinkage - mils/in.	2.0-3.5	2.0.3.0	2.4-2.6	2.1-2.3
After Sheinkoon mile in	0.0-0.6	0.0-0.4	0.0-0.5	0.0-0.7
Specific Gravity	1.90	1.92	1.97	2.02
Tensile Strength 25°C, psi	6400-7400	5730-7370	5700-7300	6900-8100
Compressive Strength -25°C, pai	20,200-24,600	24 . 100 - 26 . 500	21.600-26.800	21,200-27,000
Flexural Strength 25°C, pai	11.900-17.100	16,500-21,900	10.900-13.500	11,200-14,200
Flexural Modulus - 25°C, osi x 105	1.97-2.11	2.29 2.41	2.43-2.47	2.25-2.31
ized impact ft the in noteh	3.5-5.5	4.4-5.8	2.0-3.0	1.4-1.8
Moisture Absorption — % Gain	0.19	0.11	0.21	0.12
Freat Distortion - C		than 390°C		
Therman Expansion Coefficient	2.04x105	2.10x10 ⁵	2.00x10 ⁵	2.09x10 ⁵
Burning Rate in /min	0 65 0 75	0.40-0.50	0.50-0.55	0.35-0.40
Rockwell Hardness, M Scale	103	103	83	89
Dielectric Strength, 25°C, Short Time V/mil	39r	380	370	410
Dielectric Strength, 25°C, Step by Step, V/mil	310	340	330	340
Volume Resistivity, As Rec'd, Ohm-Cm	2.5x1013	9.7x1012	1.3x1013	1.5x1013
After 4 days at 35°C & 90% R. H	1.8x1012	1.9x1012	1.1x1013	1.4x1012
Surface Resistivity, As Red'd Ohm-Cm	9.1x1011	3.5x1011	7.0x1011	5.9x1011
After 4 days at 35°C & 90% R. H	2.0x1011	1.7x1011	1.7x1011	1.8x1011
Volume Resistance, As Rec'd, Megohma	5.2x10 ⁸	2.0x10 ⁵	2.7x10 ⁶	3.0x10 ⁶
After 4 days at 35°C & 90% R. H	3.8x10 ⁶	4.0x104	2.3x104	2.8x104
Surface Resistance, As Rec'd, Megohma	4.2x104	1.8x104	3.2x104	2.6x104
After 4 days at 35°C & 60% R. H. Arc Resistance, Seconds Max.	9.2x10 ³	7.6x103	7.7x10 ³	7.8x103
Arc Resistance, Seconda Max.	188	183	189	184
Min.		128	173	183
Ave.	184	164	186	183
Seconds, 20° at 130°C Measured at 130°C Max.	154	130	183	135
Min.	141	14	146	128
Ave	147	94	163	131

Glass Fiber—Polyester Molding Materials

By Albert G. H. Dietz,

Massachusetts Institute of Technology

Two principal types of glass fiber reinforced molding putties are employed. Molders who make up their own formulations customarily begin with a laminating type of polyester of the kind employed for standard reinforced plastic layups. To this they add varying percentages of glass fibers cut to various lengths, usually in the vicinity of one-half to one in. Frequently, fillers such as clay are added to this combination to increase the ease of molding and to reduce the cost. Advantages of this approach are that the molder can formulate the material for any particular application by varying the types of polyesters, glass fibers, and fillers, and the proportions of each.

Disadvantages of this approach are relatively short storage life requiring the material to be mixed more or less as needed, the lack of control by the purchaser over the molder unless he maintains an inspector in the molder's shop to make sure that the formulations employed are those specified, and the somewhat lower temperature characteristics of many of these mixes as compared with the factory-mixed materials.

The second type of molding material commonly employed is factory mixed. employing an alkyd resin as the base. Advantages of this type of material are that it is ready to use and requires no shop mixing, it is fully stabilized in order to give it the neccessary storage life, it is made in relatively large quantities in the factory under better quality control than would be realized in many individual molding plants, there is less segregation of the resin and the glass fiber when molding pieces with deep draws or thin sections, the purchaser has better control of the finished part because he does not depend upon the molder to mix the material properly, and the finished parts are likely to be more resistant to high temperatures.

Both types of materials when properly handled provide good mechanical and physical properties. Because the materials are still relatively new and under considerable development, properties can be given only approximately.

In Table, 1-A on lower portion of the preceding page are given four typical formulations of materials mixed in the shop. They are called: General Purpose, Fire Resistant General Purpose, Low Cost General Purpose, and Fire Resistant Low Cost. It will be

seen that the fire resistant grades contain some antimony oxide to increase the resistance to flame and high temperatures. The lower cost grades contain higher percentages of clay filler than the general purpose grades. Properties indicated in the table are for compression molded specimens of small size.

Table 2 presents the physical properties of a factory-formulated glass fiber reinforced alkyd having good electrical properties and good flame resistance. Here again the properties listed are for small compression molded specimens.

The values given in Tables 1-A and 2 can be varied widely by changing

mixes and proportions and by molding procedures.

In shop-mixed or proprietary formulations the glass content is usually not less than 10 per cent and may be considerably more. One molder states that he finds it seldom pays to go to more than 20 per cent glass fiber by weight because greater percentages do not give increased strength, but lessen the flow characteristics and lower the general appearance of the molded part. Other molders may use greater percentages depending upon the application. One important reason for formulating molding putties is to use waste glass fiber mat. Wastage of mat

(Turn to page 92, please)

TABLE 2

PHYSICAL PROPERTIES OF FIBER GLASS REINFORCED ALKYD

MOLDING PROPERTIES	
Bulk Factor	6 9 (can be reduced to 3-4 by simple hand compression)
Mold Temperatures	290-310 F
Molding Pressures	1200-2000 psi
Mold Shrinkage (cold piece from cold mold)	0.001 0.004 in./in.
PROPERTIES MOLDED	
Physical:	
Specific Gravity	2.0
Water Absorption:	
24 hours at 25°C	0.10-0.20%
48 hours at 25°C	0.15-0.25%
7 days at 25°C	0.25 0.35%
Heat Resistance:	
Long Periods	not over 300 F
Limited Periods	not over 350 F
Short Periods	not over 400 F
Heat Distortion	greater than 400 F
Heat Capacity	0.26 cal/gm°C
Coefficient of Thermal Expansion	10 x 10 6 to 3) x 10 6 in/in/F
Thermal Conductivity	8 x 10 ⁻⁴ to 12 x 10 ⁻⁴ cal/sec/cm ² /1 C
Flame Resistance	Self-extinguishing
Mechanical (compression molded):	
Impact Strength	fzed, ft lb/in, of notch 10-14
Compressive Strength	20,000-25,000 pai 14,000-17,000 pai
Tensile Strength	6,000-10,000 pai
Modulus of Elasticity .	2,000,000-2,500,000 pei
Barcol Hardness	70-75
Chemical:	
Resistance to Acida	Resistant to Weak Acids
Resistance of Alkalis	
Resistance to Hydrocarbon Solvents and Alcohols	Substantially no effect produced by organic liquids
Resistance to Ketones and Chlorinated Solvent	Slightly effected
Elertrical:	
Arc Resistance (ASTM-D-495)	180 + sec.
Dielectric Constant:	
60 cycles	5.2-6.0
1 megacycle	4.0-4.5
Dissipation Factor:	
44	0.023-0.024
60 cycles	0.023 0.024

COST OF THE OHIO TURNPIKE*

Preliminary Expense	\$ 600,000
Cost of Right-of-Way	
Construction Cost	222,213,638
Cost of Utility Adjustments	2,170,000
Cost of Engineering	18,889,000
Legal and Administrative Expenses	900,000
Cost of Initial Maintenance Equipment and Supplies	1,600,000
Contingencies	25,760,362
Total	\$283,356,000

^{*} Excluding interest during construction and financing costs.

|Source: Ohio Turnpike Commission|

ESTIMATED SAVINGS IN MONEY ON OHIO TURNPIKE*

	Range of Savings Resulting
Class of Vehicle	From Using Turnpike
Passenger Vehicles	\$ 3.90 to \$ 6.50
Light Trucks	5.70 to 9.00
Medium Trucks	12.70 to 19.50
Heavy Trucks	22.10 to 29.30

^{*} Not including toll charges.

[Source: Ohio Turnpike Commission]



U. S. Turnpike

-a Factor in

Tills year marks the beginning of construction on a third major high-speed expressway, the Ohio Turnpike. When completed, it will forge another link in the toll road chain toward the west. Teaming up with the New Jersey and Pennsylvania turnpikes, the new 241-mile long through-way will provide an

express road from New York City to the northeast Indiana border. A major question is whether present forecasts of traffic will be widely underestimated as was the case of both the Pennsylvania and New Jersey roads. Authoritative estimates state that approximately 5 million vehicles per year will utilize the Ohio

facility. This was also the original estimate of the New Jersey Turnpike Authority for its road, and already it has been greatly exceeded.

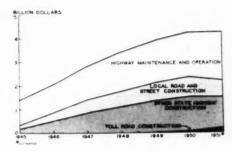
According to the latest available information, New Jersey officials place the turnpike traffic at about 18 million vehicles for 1952, its first full year of operation. This was an increase of 139 per cent above the 1952 estimate of traffic and revenue engineers, which was made in 1949 for the purpose of financing this turnpike. Their figures were 7,600,000 vehicles or a daily average of 20,765 vehicles for 1952. The turnpike carried traffic which was not expected until 1968.

Pennsylvania authorities, back in 1940, originally estimated that approximately ¼ million vehicles per year would utilize the modern road. In 1951, the Pennsylvania road carried 9 million cars, trucks,

SAMPLES OF ESTIMATED SAVINGS IN TIME ON OHIO TURNPIKE

	Passenger Cars	Commercial Vehicles
Cleveland-Toledo	1 hr. 27 mins.	2 hrs. 13 mins.
Cleveland-Pittsburgh	1 hr. 43 mins.	2 hrs. 37 mins.
Cleveland-Detroit	1 hr. 27 mins.	2 hrs. 13 mins.
Cleveland-Chicago	2 hrs. 48 mins.	4 hrs. 08 mins.
Pennsylvania line-Indiana line	3 hrs. 09 mins.	4 hrs. 20 mins.

|Source: Ohio Turnpike Commission|



In 1951 toll road construction reached a sixth of state highway building expenditure, but it accounted for less than six per cent of all 1951 highway expenditures. (Source: Federal Reserve Bank of Chicago).

Expansion TRUCK DESIGN?

buses, and other vehicles. Traffic carried during 1952 almost doubled the 1951 figure; over 17 million vehicles used the road last year. Gross revenue from tolls and concessions was over \$20 million.

Unless toll roads are built to handle the greatly increasing amount of traffic, the super-expressways may eventually become no better than some of the free roads which parallel them. Fortunately, all of the existing turnpikes are adequate to the present day need, even though constructed for a lesser quantity of traffic.

But, are they adequate for the future? During 1952, the number of registered cars, trucks and buses increased by some 2.64 per cent over 1951, and the number of vehicles on the road has increased by almost two-thirds in the past decade.

If planned to handle future traffic problems, a turnpike can be a vital factor in the design of some forms of highway transportation. B. B. Bachman, vice-president, Autocar Co., recently cited an exhaustive comparative study of truck and tractor-trailer operation on the Pennsylvania Turnpike, and on U. S. Routes 30 and 11 which are rated as good state roads. He stated that average speeds are up to 50 per cent greater on the turnpike, miles per gallon as much as 73 per cent more.

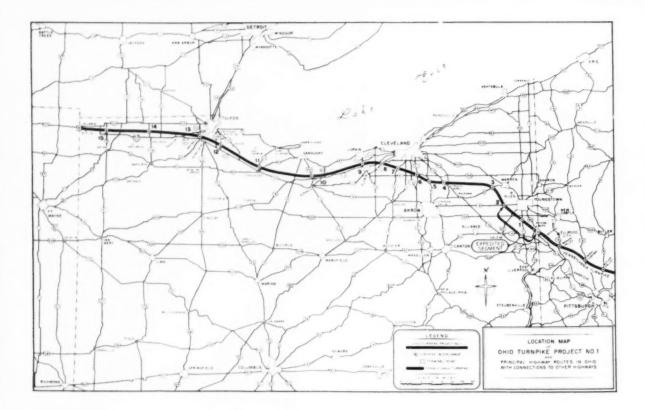


This aerial view of the Pennsylvania Turnpike shows the Lebanon-Lancaster interchange which is one of 24 such interchanges which connect the toll road with other important national and state highways. (Photo courtesy "Penna." Turnpike Commission).

ton-miles per gallon up to 74 per cent greater and, most significantly, the ton-miles per gallon times the miles per hour up to 210 per cent greater. This data came from a series of tests known as the Pennsylvania Pilot Study.

Mr. Bachman said, "The fact that vehicles can be built that can capitalize on the characteristics of these high type roads is also encouraging in that we can see great areas of opportunity still to be exploited in highway transport."

Although most toll roads have been built primarily to relieve passenger car traffic on regular roads, commercial users bear the brunt of the cost. In a statement issued by the Pennsylvania Turnpike Commission,



nearly 60 per cent of the revenue collected on the 327-mile expressway is derived from trucks and buses, although 80 per cent of the vehicles using the road are passenger cars. The Commission's statement of traffic and revenue for the fiscal year ending May, 1952, shows that 1,730,417 truck and bus operators paid \$9,484,003 in tolls. Passenger cars numbered 7,061,850 and the revenue totaled \$6,608,385.

The New Jersey Turnpike Authority reports that about 10 per cent of the vehicles traversing the toll road are commercial. Pleasure and commercial traffic combined paid tolls amounting to \$16.2 million. However, no breakdown has been made between the amount

paid by commercial users. It is generally conceded that it would compare favorably with the Pennsylvania percentage.

It is estimated by turnpike authorities that by 1956 ten major toll roads will cover more than 2000 miles of the United States, and it will be possible to drive over easy grades from Maine to Chicago without stopping for a single traffic light or crossroad intersection. The beginning of work on the Ohio road and toll road studies in Indiana indicate the interest of Midwesterners in the possibility that toll roads offer a dramatic solution to the highway problem for cross state transportation.

Detroit Library Given Automotive Collection

The Detroit Public Library has received a significant collection of automotive historical data known as the D. Cameron Feck Collection, consisting of an early history of the automobile and containing more than 69,000 items with a weight of 11½ tons. The collection was purchased with funds donated jointly by the Automobile Manufacturers Association and the Friends of the Detroit Public Library, Inc. It includes books, magazines, catalogs, instruction books, sales literature, photographs, racing data, technical reports, letters of automo-

tive pioneers and other reference material pertaining to the automobile, such as sheet music, joke collections, greeting cards, valentines, and fashion plates.

The collection is the second largest dealing with automobile material presented to the library in the past year. About six months ago the Charles Brady King collection was presented by Mr. King. The library also possesses the Andrew F. Johnson Collection, the Sir David Salomons-Bendix Collection, and with other materials assembled over the past half century probably has the largest and most complete automotive library available anywhere.

Electronic Follower to Aid Machining

Raytheon Manufacturing Co. has developed a new electronic duplicator attachment for lathes and milling machines. In operation, the duplicator acts as a guide for the cutting tool, following the contour of a master pattern and translating the contour electronically to the proper tool setting. It allows control of the vertical as well as the horizontal field of the product to be duplicated and can duplicate a master pattern hundreds of times. Its first use will be the manufacture of airplans parts but it also will be applied in the automotive and other industries.



Power Steering Gear Simplified and Improved

Parts reduction, weight and cost saving are the result of extensive redesign of Hydraguide power steering which will appear on the Chrysler Corp. line this spring. Gemmer Manufacturing Co. has taken advantage of several of the latest developments in materials and processing methods to produce the new unit. The overall number of parts has been reduced by 30 pieces (some new ones were added) and the total weight is said to have been reduced over 25 per cent.

Through aluminum die casting and sand casting, powder metallurgy, and injection molded plastics processes Gemmer has realized economies in manufacture, machining and assembly. The new steering unit has a cleaner look—there are no more exterior oil lines—and simplified service necessities.

Greatest changes are in the housing. An aluminum die casting replaces the malleable iron casting used before. Weight on this part was reduced 58 per cent, and the new design with internally cored oil passages eliminated 25 parts and simplified manufacture. Two oil seals were eliminated by using the pumping oil as the worm gear lubricant, in place of grease.

The power cylinder now is cast in high strength grey iron, instead of being a drawn cup. Weight was increased and two parts were added, but the saving in assembly offsets this.

The valve body, previously machined from an iron

casting, now is die cast from aluminum. Finishing operations are reduced to drilling or tapping holes and to undercutting. Weight was reduced 75 per cent and three parts were eliminated. Similar savings were made in the valve body cap, which in iron was finished nearly all over, and in aluminum requires only burnishing one hole.

The three-piece cast iron power piston formerly used is now made in two aluminum die castings. Six parts were eliminated from the piston assembly, and a saving in weight was achieved by the new construction.

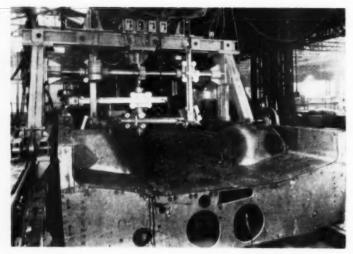
A new seal was developed to withstand the 240-lb radial forces exerted by the power piston, and to prevent metal contact between the piston and cylinder wall. Its rectangular rubber section is backed with an injection molded Nylon ring. Cost was reduced and service life is expected to be greater. The column and driver is now a one-piece forging. It had been made from tubing butt-welded to a machined driver at greater cost.

For easier manufacture and assembly, the worm adjustment was changed from the shim type to a threaded type using an Allen head screw. An Elastic Stop Nut over the screw serves the double purpose of locking the adjustment and sealing in oil by means of a Nylon insert. Although the number of parts was increased by four, Gemmer believes the gains in manufacture and service warrent this new preload method.

Bus of Knockdown Type Developed In France

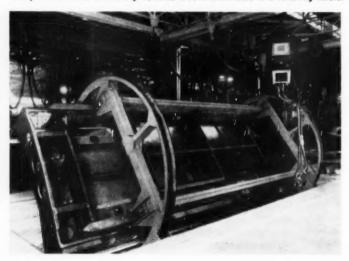
By W. F. Bradley

Special European Correspondent for AUTOMOTIVE INDUSTRIES



Box platform on the assembly line. Side panels and cabs will be bolted to this structure.

Box platform which carries engine, axles, etc., is shown here in a revolving fixture.

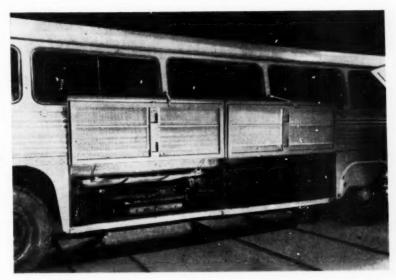


PARIS, FRANCE

HE Chausson Co. of Paris, largest European producer of integral body and frame buses under Budd license, has developed a knockdown type which can be assembled with a minimum of labor and has the additional advantage of reducing shipping space by more than one-half.

The coach is composed of six main elements: a box platform carrying all the mechanical units; two side panels; a roof; and a front and a rear cab, the main stampings of which are interchangeable. The knockdown model uses the six-cylinder Hercules Diesel underfloor engine, built in France by the Hispano-Suiza Co.

Use of a horizontal engine has involved a redesigning of the vehicle and the installation of a separate assembly line. The box platform forms the basis of the entire structure. It has a central longitudinal channel-section steel stamping of 18.5 in. in height, to which seven cross members are welded. Between cross members No. 5 and 6, counting from the front, a break has to be made for the axle, and this is done by a bridge construction composed of two longitudinal U-section steel stampings, to each end of which two heavy gussets are welded. The gussets are drilled to receive the spring eyebolts and shackles, and each longitudinal member with its four gussets forms a sub-assembly, which is sent to the main assembly line to be welded to the main transverse members. The floor is welded to all the transverse members and to





Arrangement of the Hercules Diesel engine and radiator. Note shroud for fan at right of Front cab unit ready to be assembled to

balance of body.

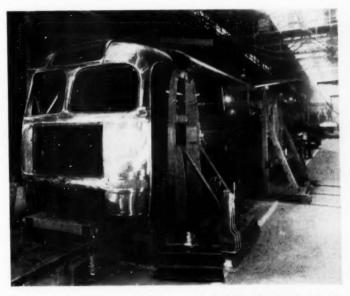
the main longitudinal section. It is flat for its central portion and slopes upwards on each side. The reason for this inclination is to increase the height of the lockers in the box platform, the two lockers on the left being respectively for engine and radiator and the two on the right for baggage. In its completed condition the box platform forms a mobile unit with its engine, fuel tanks, transmission, and front and rear axle. Only the steering gear mechanism is missing.

Each of the two side panels is built up into a single unit. The roof also is welded up into one unit. The main stampings for the two cabs are interchangeable and the design provides for left or right-hand steering, the changes being limited to the internal panelling. The five elements are bolted up to the box platform, a single size bolt being used throughout, and the nuts being oval-shaped plates to distribute the load.

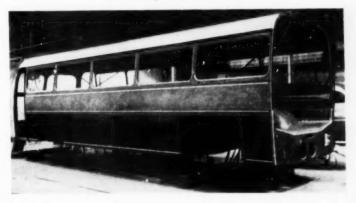
Normally a single-plate Ferodo clutch is used to transmit the power to the separate five-speed transmission. However, provision is made for a fluid coupling and pre-selective transmission. In both cases the rear axle is double reduction type with spiral bevel and spur gears. Suspension is by semi-elliptic springs all round, but optional equipment is a supplementary variable-rate suspension by means of torsion bars. The radiator is set fore and aft in a compartment behind the engine and is shrouded to a turbine, the fan of which

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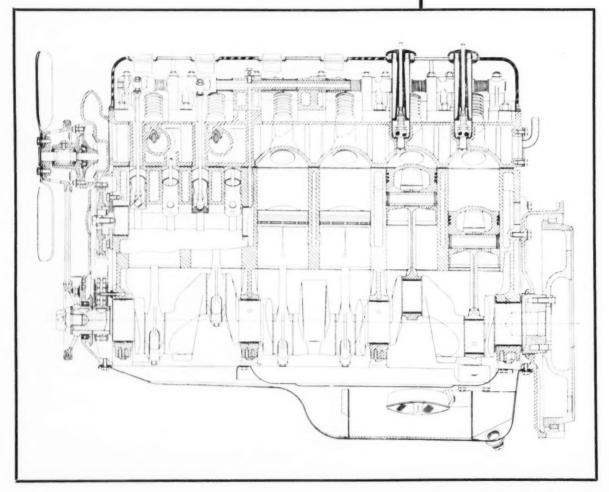


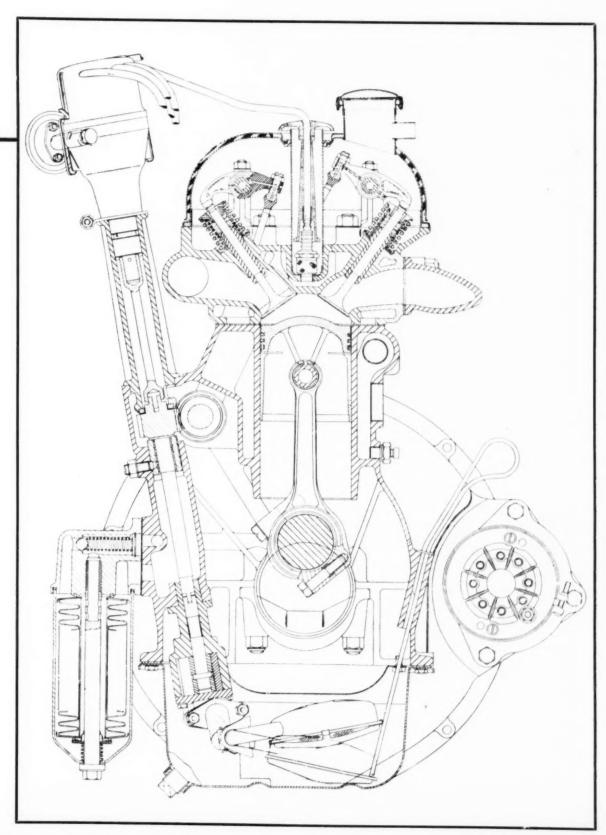
Front cab and roof are positioned for assembly by bolting together in this fig. Partially assembled Chausson coach. Side panels, roof, and front cab are attached to the box platform in this view.



Armstrong Siddeley Sapphire

Lere are two sectional views of the six-cyl, overhead-valve engine which powers the Sapphire model sedan made by Armstrong Siddeley Motors, Ltd., of Coventry, England. The engine is "square" with a bore end stroke of 3.54 in. Piston displacement is 209.64 cu in., and compression ratio is 6.5 to one. Maximum output of 120 brake horsepower is developed at 4200 rpm and maximum torque of 165 lb ft at 2000 rpm. Piston speed at maximum brake horsepower is 2480 fpm.





Connecting Rod and Piston Automation

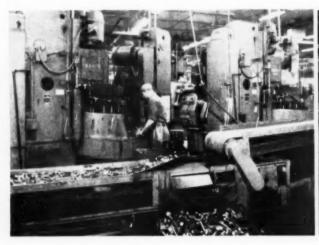
By Joseph Geschelin

Dealing With the Ford Cleveland Engine Plant, This Article Points Out Several of the Cleverly Conceived Devices That Are Utilized For Automaticity in Production

One of the seven-station Baker vertical drilling machines on the connecting rod line—drilling, chamfering, and reaming the piston pin hole with step-by-step procedure. Another excellent example of automation, this view shows the conveyor belt carrying rods which are picked off by the operator for feeding into the machine. Three rods are mounted at each loading position. A UTOMATION, as it has been developed by Ford Motor Co., is an amazing management tool designed to coordinate the movement of raw materials to machine and process lines in a completely automatic sequence, eliminating all handling at intermediate points and at transfer points as well. Within machine lines, automation completes this picture by requiring special arrangements at each machine for automatic loading and unloading, and ejection onto a conveyor line to the next operation.

This principle naturally is in a state of flux and each new application in Ford plants embodies refinements stemming from previous experience. One of the latest and most interesting of these applications will be found in the Cleveland Engine Plant. This article covers specifically the highlights of piston and connecting rod machining. It will be noted that here and there are some operations which require manual loading and unloading because of the nature of the special machine for the purpose. Doubtless even some of these ultimately will be made completely automatic as experience is gained in their use.

One of the best examples of automation is found on the piston line. Here the rough aluminum alloy castings are loaded onto a belt conveyor and transported directly to a battery of five No. 7 Baird automatic six-spindle horizontal indexing lathes. These are designed for automatic loading and unloading, receiving pistons from the conveyor belt by a gravity chute, then ejecting the work into a chute which carries it to another conveyor belt on the opposite side at a lower level for transportation to the next operation.





Baird automatics are tooled to rough- and semi-finish-turn the OD; rough- and finish-face the head end; rough- and finish-turn ring diameter and widths; chamfer the OD at the head end and at the No. 3 ring groove. Each machine is capable of finishing about 400 pieces an hour.

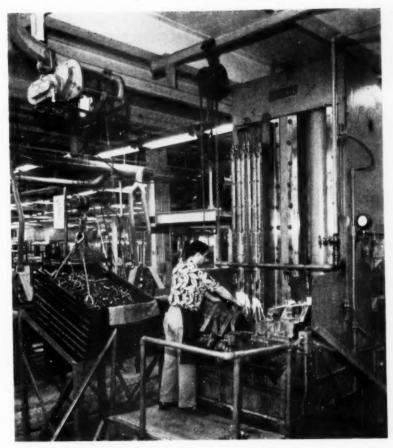
Pistons then travel on the conveyor belt to a group of Hammond rotary indexing machines for chamfering one end. Parts are raked off the belt and carried into the deburring machines, where they are loaded and unloaded automatically. Upon completion of this operation pistons are ejected automatically into a chute which carries them to a group of special Morris automatic weight milling machines. Equipped with automatic loading and unloading mechanisms, the weighing machines are arranged to reject light or heavy pistons ejecting them out of the magazine and into suitable containers on the floor.

Normal weight pistons, on the other hand, are corrected to standard weight within one to two grams and these are automatically ejected onto the

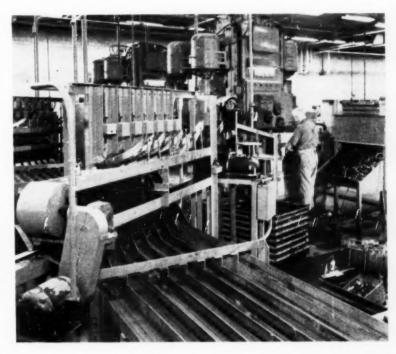
(Left)
Special Ex-Cell-O, four-station, three-way precision boring machine tooled for precision-boring

both the crankpin and piston pin bores in the same setting.

Close-up of the automatic mechanism for the weighing and sorting of connecting rods. Work is fed to the Toledo scale, weighed, sorted according to weight classifications, and distributed through the proper chutes into the divided conveyor in the foreground.



This big Lapointe 15/66 duplex ram vertical hydraulic surface broaching machine is used on the connecting rod cap line. In one setting this machine rough-and finish-broaches the joint face; rough- and semi-finish broaches the half-round bearing surface; and rough- and finish-broaches the width.



belt conveyor leading to the centerless grinders.

Next major operation—rough-grinding of OD and ring lands—is performed in a battery of No. 5 Cincinnati centerless grinders of through-feed type. At each machine the pistons are raked off the conveyor belt, directed to the magazine feed and automatically loaded in the grinder. After grinding, the pistons are permitted to slide into a chute leading to a belt conveyor for transport to the next operation.

Precision boring of piston pin holes is done auto-

matically in a large battery of Ex-Cell-O single-end boring machines. These machines are fed by an overhead chute leading from the belt conveyor, automatic loading being designed to locate the piston in the fixture, clamp automatically, then bore. The unloading mechanism then ejects the work into an inclined chute leading to the belt conveyor.

Ring lands are finish-ground in a battery of No. 5 Cincinnati five-wheel, in-feed grinders, using automation to facilitate automatic loading and unloading. The work is finally loaded onto a belt conveyor for transportation to the battery of Baird vertical four-station machines for automatically chamfering the outer end of the piston pin hole and milling lock ring grooves in the same setting. Control of the cycle in the Baird machines is quite intricate and required considerable development. In the first position the work is automatically gaged for size, oversize bores being automatically rejected. In the second position the first retainer groove is milled and the hole chamfered. The third position is used for rotating the piston 180 deg to present the opposite side. Then at the fourth position the second retainer groove is milled and the hole chamfered. Work is automatically ejected at this point into a chute leading to the belt conveyor.

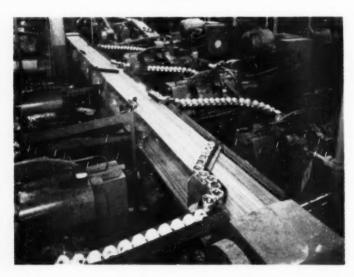
Automation carries the pistons to a battery of No. 2 Cincinnati centerless grinders of in-feed type for finish camgrinding of the elliptical skirt. These machines require hand feeding and hand unloading by the nature of the operation. The work comes in on the belt conveyor, is raked off onto a stock table, then is positioned in the machines by hand. Upon completion of this operation, the operator removes the work and places it on an overhead conveyor for transportation to the plating machine.

After tin-plating in the automatic plating machine the pistons are transported to a special station for cleaning and burring the piston pin hole. This is followed by final inspection in a special column type Sheffield Precision-



Group of Kreuger angular tour-spindle, eight-position boring machines for rough- and semi-finish-boring of the crankpin hole. This operation is on the rod and cap assembly, the work being fed to the machine on the belt conveyor seen in the foreground.

First major operation on pistons is the rough- and semi-finish-turning of the OD; rough- and finish-facing of the head end; chamfering the head end—in a battery of Baird automatic, six-spindle horizontal indexing lathes. Here we see one of the best expressions of the art of automation—automatic feeding of work to the machines, automatic loading and unloading.



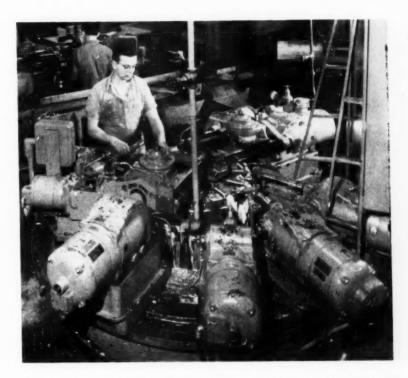
aire gaging machine. Here the piston is placed in a fixture and checked for grading of piston pin diameter and skirt diameter. Piston skirts are graded and marked in a range of eight skirt diameters, varying by 0.0003 in. Piston pin diameters are graded in three sizes, varying by increments of 0.0001 in.

A noteworthy feature of connecting rod and cap machining is the automatic arrangement for weighing and grading partially machined pieces so as to make parts of equal weight. This simplifies the problem of weight balance later on and assures assemblies of equal weight for installation in the engine.

Connecting rods and caps are forged separately and handled separately on machine lines up to the point of subassembly. Considering the cap first, it is of interest that its formation is done in two steps in Lapointe vertical surface broaching machines. Starting with the rough forging, the width of the cap is rough- and semi-finish broached to limits of 1.264-1.267 in. in a Lapointe 10/42 double-ram vertical surface broaching machine, fitted with automatic clamping fixtures holding two pieces at each station.

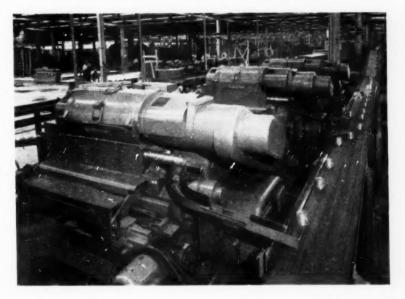
The very next operation is that of automatic weighing and sorting. To this end the work is removed by hand from the fixtures in the broach and loaded into a chute leading directly to a specially designed six-station Toledo scale weighing machine. At this machine, each piece is weighed and compared against a master weight cap for each grade. Stations 1 and 6 reject underweight and overweight caps, respectively, directing such parts along the partitioned belt conveyor which carries them to suitable pallet boxes for disposition. The other four stations grade the caps

(Turn to page 90, please)

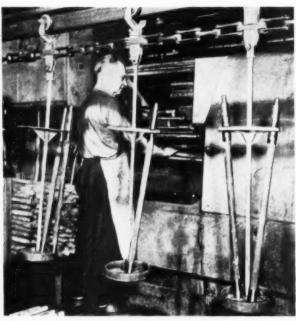


Drilling of two oil holes and milling of the bearing anchor slot is handled in the five-station, semi-automatic indexing Kingsbury machine. Work comes to the machine by automation on the belt conveyor in the background but the machine has to be loaded and unloaded manually.

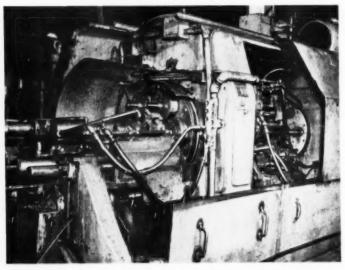
Rough-grinding of piston OD and ring lands is handled in this impressive battery of No. 5 Cincinnati through-feed centerless grinders. Pistons arrive at each machine on the conveyor belt to the left and are guided into the machine through an inclined chute from the conveyor. Loading and unloading are fully automatic. When finished, the work is ejected through the chute at the right and guided onto the conveyor belt at the right for transport to the next operation.



Axle Shafts Machined on Special Automatics



View of one of the National Acme-Gridley automatics on the machine line at Chrysler's Lynch Road plant. In the foreground is the parts conveyor transporting machined shafts to the next operation. Rough forgings, as they come to the machine, may be seen at the extreme left.



Closeup of a working end of one of the automatics. At the left is the rear slide, with the tooling for machining one end of the axle shaft. Several finished ends may be seen in the two upper spindles. Housed in this section of the machine are the special chucks for holding the shafts. The mechanism for leading and unloading shafts at Station 5 is mounted at the extreme front end to the right.

ACHINING of rear axle shafts at the Lynch Road Axle Plant of Chrysler Corp. is done on special National Acme-Gridley automatics with floor-to-floor cycle of 200 pieces per hour. This is probably the first, or certainly one of the first, applications of this type of automation equipment for axle shaft machining in mass production. At the present writing the plant has in operation a battery of five 2^{5} 8 in. National Acme-Gridley special double-end automatics of six spindle type.

The Chrysler axle shaft is an alloy steel forging about 31% in. long, having a 1¼ in. diameter splined section at one end. The other end has four different steps—a 1% in. bearing diameter; a bearing shoulder 1½ in. in diameter; a tapered section 1% in. in diameter, 4 7/16 in. long; and a ¾ in. threaded end. These sections at both ends of the long shaft are machined completely in one cycle of the machine at the rate of 200 an hour.

The sequence of operations, fully automatic except for loading and unloading, is as follows:

Station 5—Load and unload.
Station 6—Front slide—turn oil seal diameter and center tapered end; rear

slide—center splined end.

Station 1 — Front slide — straddle-turn shoulder, rough-turn thread diameter, turn bearing diameter; rear slide—rough- and finish-turn spline diameter.

Station 2—Front slide—rough-and finish-turn taper section; rear slide face end and chamfer.

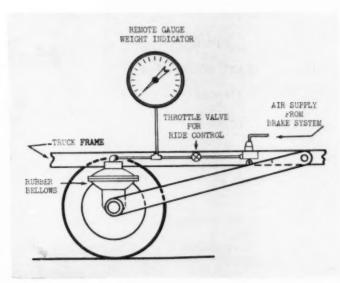
Station 3 — Front slide — finish-turn threaded end, form-turn the end.

Station 4 — Front slide — chase ¾-16 thread, turn shoulder diameter.

As illustrated, loading is done at the center by the operator. The machine is provided with an automatically operated loading mechanism which pushes the shaft into position for engagement with two special chucks, one near each end. The chucking mechanism is mounted within the machine structure at the left. Each pair of chucks, at each station, is actuated by a unique power cartridge containing a stack of Belleville washers which are compressed initially and

(Turn to page 100, please)

Chassis Suspension System



This schematic illustration shows arrangement of principal components of the Pnu-Ride Weighmaster System.

Incorporates Weight Indicator

A UNIQUE form of chassis suspension system intended for motor trucks, truck-trailers, and buses has been developed by Weber Instrument Co., division of Link Engineering Co., Detroit 27, Mich. Known as the Pnu-Ride Weighmaster System, it consists of an air cushion suspension combined with a means of weighing the load anywhere en route, using a remote weight indicator which can be installed in the cab.

This air suspension system, designed to take the place of conventional spring suspension, is said to cost less than conventional suspensions. Moreover, it has additional advantages of interest to the vehicle producer as well as the user. With air suspension, vehicle height is maintained at a constant level, whether loaded or unloaded, and regardless of improper or unbalanced loading. Air pressure is employed to achieve this result, pressure being automatically increased to compensate for increases in loading. It is said to keep

the vehicle on an even keel, particularly on curves, and to permit safer driving at higher speeds.

Details of this system have been covered by patent application and it is the intention of the company to license vehicle manufacturers interested in its applications.

The special weighing system is incorporated as a part of the suspension, providing accurate weight readings for the benefit of the driver and warning when the load limit has been reached, before leaving a loading dock. In addition, the gage enables the driver to know the weight of a heavy load such as a piece of machinery, for determining carrying charges.

The Pnu-Ride system operates off the air brake line and requires only 20 to 50 lb pressure to support a load of 9000 lb on one air cushion. Almost any kind of commodity hauled over the road by vehicles equipped with air brakes may be loaded by weight readings.

Plant Safety is Film Subject

The foreman's key position in the plant safety program is the theme of two safety films released by the National Safety Council.

"Pick Your Safety Target," an allcolor cartoon film based on actual accident-reduction plans within industry, features a foreman beset with an accident-ridden department. The film sets forth a three-step plan for detecting accident causes and taking corrective action. The film shows how a definite accident pattern emerges. From the pattern, a series of safety targets are set up, which provide the foreman with specific goals. The foreman is shown how his accidents can be substantially reduced by aiming at one target at a time.

The second film, "A Gray Day for O'Grady," employs a series of comedy situations to dramatize the high cost of accidents. O'Grady, the new foreman, learns that it takes time and money to prevent accidents, but that

it takes a lot more time and money to have accidents.

"A Gray Day for O'Grady" is available in 35mm sound slide film (b & w) and 16mm sound motion picture (b & w). "Pick Your Safety Target," filmed in stop-motion cartoons, is available in 35mm sound slide (color) and 16mm sound motion picture (color and b & w). For additional information and prices, write the National Safety Council, 425 North Michigan Ave., Chicago 11 Ill.

ATWOOD PRODUCTS

FOR CARS, TRUCKS

and TRACTORS

DOOR ASSEMBLIES

Locks
Hinges
Checks
Remote lock controls
Lock strikers
Hold open devices
Cross member

CHASSIS & MOTOR ASSEMBLY

Shock absorber brackets
Rebound bumper brackets
Accelerator shafts
Torsion bar supports
Cross members
Clutch plates
Metor flanges
Brake controls
Bell crank accelerator controls
Brackets

HOOD ASSEMBLIES

Locks
Geared hand hinges
Hinges
Latches
Supporting brackets
Mounting brackets

INTERIOR BODY ASSEMBLIES

Seat adjusters
Ventilator controls
Giove compartment hinges
Auxiliary seat props
Steering wheel rings
Seat frames

TRUNK ASSEMBLY

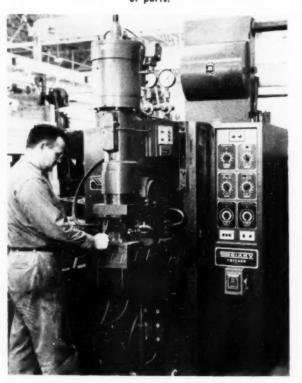
Trunk locks and hinges
Lift gate brackets
Tail gate hinges
Trunk props
Tail gate props
Tail gate latches
Supporting brackets
Mounting brackets
Trunk latches

Making a Wide Variety

Late in 1952 the Atwood Vacuum Machine Co., held open house to signalize the opening of its newly built plant in Rockford, Ill. Architecturally one of the most modern buildings in the industry, it features a skilifully planned layout of equipment and materials flow aimed at the most economical production of the variety of heavy stampings and fabricated parts assemblies being supplied to many prominent vehicle manufacturers in the automotive industries.

Starting back in 1918 with the development of an adjustable type door bumper for passenger car bodies, Atwood plunged into the manufacture of door hinges and hardware items, and today has expanded its services to include a wide variety of heavy stampings and

This Sciaky resistance welder is employed as a flexible general purpose welder for a variety of operations on a number of parts.



of Motor Vehicle Parts

fabricated assemblies for doors, hoods, trunks, body interior parts, chassis and engine assembly parts. A condensed listing of some of the spacific items now being produced for the automotive industries is given in tabular form.

This specialization of the hidden parts of vehicles stems from extensive facilities for design and development in conjunction with the customers, and includes research engineering and testing of advanced ideas as well as items released for production. The company has its own facilities for designing and making special tools, dies, and fixtures required for samples and production runs.

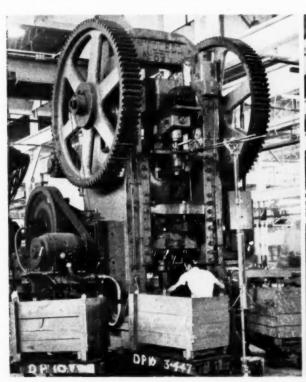
Manufacturing facilities are extensive, include many

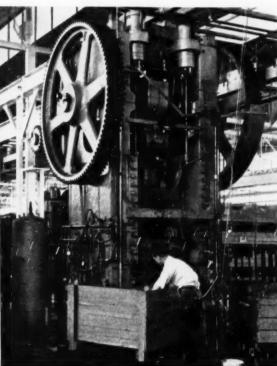
kinds of special equipment unique to this type of operation. Here will be found large bays with presses of every description and in a variety of makes for handling the stamping and formation of the gamut of parts. So much of the product is produced by press stamping that Atwood has become an acknowledged specialist in this technique and has been successful in developing special methods and tooling to facilitate productivity and reduce cost to the customer. Moreover, this specialization has been instrumental in designing for fabricated parts and assemblies to replace castings and forgings where possible economically.

Because of the large number of customers, including the military establishment, the operation generally is

Among the larger presses tound here is this 660-ton Toledo press. Note the safety device for protecting the operator.

An enormous battery of presses of various ratings and types is found at Atwood. The one seen here is a 440-ton Bliss used for heavy formations.





AUTOMOTIVE INDUSTRIES, April 1, 1953



Taylor-Winfield butt welder of heavy duty type is used, among other things, for the joining of fabricated sections.

designed for short runs and large batch production rather than the extremely large runs common in mass production. And, as a result, Atwood works almost exclusively with heavy strip stock rather than steel in coils.

Flow of materials is arranged skillfully to bring in all raw materials by rail or truck at one end of the building where it is stored, sheared to size, and moved directly to the production lines. From this point on, operations progress to the opposite side of the plant, ultimately leading to assembly and shipping.

In addition to extensive press facilities, the plant is organized in specialized departments for high speed production milling and drilling, heat treating, electroplating, and painting. In this case, the variety of parts and of detail operations is so great as to defy any attempt at outlining specific operational sequences.

Many fabricated assemblies and parts require detail welding operations and, depending upon the nature of the job, Atwood uses all of the modern methods, such as spot welding, are welding, and resistance welding, including butt welding.

Because it is not feasible to give the details of individual items of production flow, we show a number of illustrations of typical equipment so as to provide a better visual picture of a sampling of facilities.

Stamping Scrap Belt Is 1100 ft Long

What is said to be the world's largest scrap handling system has been designed and constructed for the Grand Rapids Plant No. 1 of Fisher Body Div., General Motors Corp. The installation can handle 500,000 lb of scrap a day.

Backbone of the system is a 4½-ft wide main scrap conveyor 1144 ft long. Normal carrying capacity is 40 lb per lineal foot, and the belt can travel at variable speeds up to 45 fpm. Power is supplied by two 10-hp motors geared by a Reliance variable speed drive with an 8:1 stepless range.

Twenty collecting conveyors, ranging from 61 to 165 ft in length, travel at right angles to the main conveyor

under rows of presses. They receive loose scrap from a chute located under each of the presses on the floor above and carry it to the main conveyor. Each of these units has a 24-in, wide belt fabricated from standard 6-inch pitch May-Fran steel belt links and having 3-in, high side wings on the outside links. They are powered by 3- or 5-hp motors, depending upon length, and have Reeves vari-speed pulleys of 3:1 ratio. Operating speed ranges from 15 to 45 fpm, and carrying capacity is 30 lb per lineal foot.

Lubrication for main conveyor is directed to the underside of belt at one point by a continuously operating Alemite Oil-Mist system. Safety switch automatically shuts off power if underside of belt, which is designed to have a certain amount of slack, tightens to a predetermined point.

Scrap travels on the belt conveyor from main plant to baler house. The conveyor automatically stops moving until a hopper which feeds two balers, comes back into receiving position.

The bale is ejected onto a 53-ft long 4½-ft wide conveyor and is pushed along to an outside discharge chute. Bales slide down the curved chute to discharge into railroad cars standing perpendicular to flow of carry-off conveyor. A reversible car-pulling conveyor has been installed outside the building.

The main scrap conveyor, tilting hopper, balers, baled scrap conveyor, car puller conveyor and chute hoist are all operated by one man from a single control station located in the baler house. Fisher conceived the original design, and May-Fran Engineering, Inc., carried out the installation.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

More Equitable Renegotiation for Firms Handling Defense Subcontracts. NPA Priority Rules Eased for Buyers of Large Machine Tools.

Equipment Write-Offs

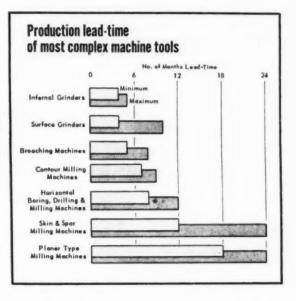
Speaking before a Joint Congressional Committee on Internal Revenue taxation, William J. Kelly, president, Machinery and Allied Products Institute, pointed out that the Institute's recommendations, made on behalf of the Nation's capital goods and industrial equipment manufacturers, would not reduce federal tax revenue overall. He stated that taxes which reduce the rate of economic growth automatically reduce the tax base itself and, thus, are the most expensive in the long run.

Changes in present depreciation policy which the Institute urged as necessary to achieve tax equity and stimulate private investment in productive facilities included: (1) restoring a wider area of discretion to business management in the determination of service lives, (2) returning to the Bureau of Internal Revenue, where it was originally, the burden of proof that depreciation deductions are excessive, and (3) permission to write off the cost of equipment over two-thirds of estimated service life.

Priority Rules Eased On Big Machine Tools

NPA has eased its machine tool order, M-41, to permit builders of specified heavy tools to accept unrated orders if they have open capacity not booked by priority orders placed by defense and defense supporting manufacturers. Equipment affected are items now listed in "Exhibit D." including large drilling and grinding machines, boring mills, lathes, die sinking machines, planers, milling machines, shapers, and gear cutting machines. The two-year-old ban on non-priority orders is being eased because deliveries of these items now is on schedule to all priority users and to enable the industry to achieve "fuller and better-planned" production. NPA says that machine tool builders have reduced backlogs to less than 30,000, or an average of six month's production, from 47,500 last July. The agency expects the backlog to continue its decline and to stand at about 17,000 orders by next July.

The Source of the Table at the Right is from a Report to the Director of Defense Mobilization by the Advisory Committee on Production Equipment, January, 1953.



Under the revised order machine tool builders will have to make available up to 70 per cent of their heavy tool output upon demand from rated order holders.

Gear Grinding Machine Co. Sold to N. Y. Group

A New York group headed by F. W. Richmond, chairman of Baker Bros., Inc., Toledo, Ohio; Brubaker Tool Corp., Millerburg, Pa., and Hendey Machine Co., Torrington, Conn., has purchased the Gear Grinding Machine Co., Detroit, Mich. The purchase price of the company, which makes universal joints, gears, grinding machines, and textile rolls, was not disclosed. It will continue to operate in Detroit under the same name, but will be incorporated in Delaware instead of in Michigan. Shepard Barnes will continue as president of

Werner I. Senger has been appointed Vice President i/c Balancing of the Gisholt Machine Co., Madison, Wis. Mr. Senger has been with Gisholt for over 35 years.



Gear Grinding and a director of the new Delaware company. Other directors include: P. O. Jones, Delmar G. Roos, B. D. Kunkle, and A. L. Baker.

Renegotiation

Firms holding defense subcontracts now may compute for renegotiation purposes the extent to which their machine tools and other machinery are employed for defense work. The renegotiation board issued the new ruling following an earlier conference with the Senate Finance Committee on the subject. Partial exemption from renegotiation of machine tools and related equipment, based on a fraction of the average useful life of the equipment, is granted in the basic renegotiation act. The new ruling further reduces the part of the subcontract price which is subject to renegotiation by taking into account the percentage of time that the equipment is used or expected to be used in renegotiable production during the first 12 months following the delivery of the equipment to the user.

New Name

Effective last month the corporate name of the National Machine Tool Co., Racine, Wis., will be changed to Heinrich Tools, Inc., of the same address.



FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81

A line of automatic milling machines, having a number of advanced production features plus several unique features for convenience and simplification of setup, has been announced. These machines are built in plain, duplex, and plain rise-and-fall styles; powered at the spindle by three or five hp motors. Standard table travel is 24 in., although longer table travel, up to 144 in., may be obtained for long, comparatively light work.

Automaticity and manual manuverability have been combined to an unusual degree for production type milling machines. Through a cycle selector unit, a single lever initiates the complete milling operation, including automatic table cycle, automatic spindle stop, automatic backlash eliminator, automatic spindle carrier cycle of RAF machines, and one extra equipment item . . . automatic spindle retraction. To aid in setting up the machine, all these automatic features can be nullified or bypassed for manual control.

An individual motor drives the spindle through V-belts and three gear contacts; three hp per spindle for standard spindle speeds, and five hp, for high spindle speeds. The spindle is quill mounted for cross adjustment. Bearings, gears, and all other parts within the spindle carrier unit are

Automatic Milling Machines

automatically lubricated by means of a combination circulating and splash system.

The walls of the bed are considerably wider than the table, and the intervening space serves to catch the coolant and chips and direct them to a chip compartment in the right-hand end of the bed.

Table ways are automatically pressure lubricated with filtered oil, and completely protected against entrance of dirt, chips, and coolant. The standard table is extra long, 55% in. from end to end, affording an extra measure of working area. Dogs are carried on the underside of a rail attached to the front of the table, where they will not be fouled with chips. The table is traversed through a conventional screw and nut arrangement, and powered by a separate two hp motor mounted on hinged rails in the bed.

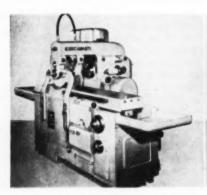
The lever for starting the automatic operating cycle has four power manual directional control positions: rapid traverse right and left, and feed right and left. In the same unit, a second lever controls the vertical traverse of the spindle carrier of RAF machines. It has three positions:

"automatic," and "up" and "down" for power manual control.

The sequence of all automatic functions is controlled by the cycle selector, actually an assembly of cams on a rather short demountable shaft in the bed. Dogs control the length of stroke only. Cycle selectors have been designed for almost every conceivable automatic cycle. No. 2-24 machines are equipped with a table cycle reverse device. This consists of a knob extending from the front of the bed, and changes the direction of table feed and rapid traverse from right to left and vice versa. A small external control lever, operated with the forefinger, serves as a setup convenience for indexing the cycle selector.

Automatic table cycles feed right or left, or alternately right and left with a center stop position for safety. Rapid traverse is at the rate of 300 ipm. Sixteen table feeds, ranging from ½ to 20 ipm, are obtained with change gears. Twenty spindle speeds range from 30 to 1200 rpm. They are obtained through change gears and an externally operated back gear. Vertical feeds for the spindle carrier of RAF machines are infinitely variable from one to 40 ipm, obtained through a dial control. Cincinnati Milling Machine Co.

Circle E-1 on page 81 for more data



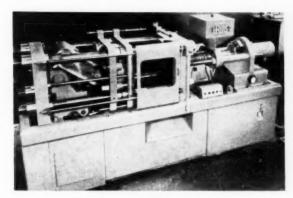
Cincinnati plain automatic milling machine.



Cincinnati duplex automatic milling machine.



Cincinnati plain automatic rise and fall milling machine.



Lewis injection molding machine.



Lewis die casting machine.

Die Casting and Injection Molding Machines

Simultaneous development of a die forge casting machine and a plastics injection molding machine was announced recently.

Both machines incorporate a basically new principle of clamping the dies or molds, the "Hydra-Lock," which is believed to be by the maker one of the most important mechanical contributions to the art of molding in many years. In addition, the die forge casting machine features a new injection system developing 100,000 lb pressure. In most other respects, the machines are similar.

The die casting machine employs the so-called cold-chamber method of injection, but introduces a new principle of injection which provides for rapid fill while the metal is molten, and unusually high final squeezing

This is claimed to prevent shrinkage voids as the metal freezes and excessive porosity due to air and gases being trapped in the dies.

In addition to a new principle of injection, the die forge casting machine features the Hydra-Lock method of clamping the dies together which develops a final clamping pressure of 650 tons.

The clamping mechanism of the machine embodies three principal elements. A small hydraulic cylinder advances the platen, on which the moving half of the die is mounted, to a position wherein the die faces are open only a fraction of an inch. A mechanical locking device holds the platen in the closed position. Incorporated in the platen structure is a 28 in. diam hydraulic cylinder, actuated automatically through the control circuits, which does the final closing of the dies and supplies the final locking pressures.

The stroke of this large cylinder is

so short that only a fraction of a gallon of oil and a few tenths of a second's time are required.

Features of the injection molding machine include a multiple packing of the injection cylinder, a quick mold release for nozzle clearance and the Hydra-Lock.

The machine employs a straight bore, externally heated injection cylinder. Plastic material enters by gravity and is packed into the heating section by multiple injection strokes. This pre-packing serves to compress the material, reducing the bulk factor, and insures maximum injection of the plasticized material.

The available injection pressures are readily adjustable from practically zero to a maximum of 20,000 psi. In special instances, this can be increased to 30,000 psi by reducing the diameter of the injection plunger.

Circle E-2 on page 81 for more data

Universal Lead Measuring Device

A universal lead measuring instrument has been designed which determines the lead of internal and external threads of work parts up to 8 in, diam and 18 in, in length.

The base supports a fixed headstock at the right end, with a tailstock at the other. Besides mounting the centers, the headstock carries what is virtually the barrel of a specifically constructed micrometer. The tail stock can be used in either of the two runways to accommodate work of various diameters, and may be locked in any position.

The longitudinal carriage runs on balls on hardened and ground ways and supports the specially constructed totally enclosed micrometer nut. A weight insures that the thrust is always in the same direction. On this, another carriage which supports the amplifying and indicating unit (magnification 400-1) is mounted and can be traversed longitudinally and locked in any desired position. The



Sheffield lead measuring unit.

stylus holder can be rotated to suit various set-ups, and a spring loading device permits a suitable pressure between the stylus and the work. The 40 tpi micrometer screw has a working travel of two in., and any small residual lead errors which may be present are corrected by a compensating attachment.

This machine can be supplied with an attachment for measuring the lead of taper threads up to an included taper of one in four on the diameter. Taper unit consists of a block incorporating a centrally pivoted sine bar, and setting is performed by means of an adjustable knurled screw against a graduated scale. Sheffield Corp.

Circle E-3 on page 81 for more data (Turn to page 76, please)



For additional information, please use postage-free reply card on page 81

(Continued from page 75)

Fast Action Clamping

A unique device has been developed that is said to solve many clamping problems. To apply the device, known as the Merriman pressure unit, weld a standard one-in. nut or tap a standard one-in, hole at the fixture or clamping area. The pressure unit is then screwed in.

By either adjusting the hollow threaded piece in the one-in. seating or loosening the set screw and moving the handle up or down the bar, the amount of travel or clearance necesary can be obtained. In applying pressure, a quarter turn is all that is required.

Merriman pressure units afford up to nine in. of clearance or travel. After engagement with the threads pieces can be clamped which vary in size up to 1/2 in. without making further adjustments. E & E Engineering Co.

Circle E-4 on page 81 for more data



sure unit.

Single Spindle Automatic Bar Machine

Model 126, a single spindle bar machine, has been placed in production and is available to the trade. Features of the automatic unit are claimed to be quicker setup; simpler camming, low cost; wide range of feeds; easily varied, wide range of spindle speeds; large work area; rigid construction; adequate power for carbides; chucking designed for hot rolled stock; ample chip clearance; large coolant capacity; simplicity, safety, and economy of operation; small floor area; and use of standard attachments.

The machine is equipped with the four standard cross slide cams necessary to cover all desired cross slide feeds. It also is equipped with a universal turret cam providing an infinite variation in feed strokes up to 6% in. and preselection of 10 automatically changed turret feeds. Stepless spindle speed variation from 80 to 1500 rpm is provided.

Considered to be the most important features of the machine are the program drum, automatic transmission with universal turret cam, and standard cross slide wedge cams actuated by the turret motion.

The program drum is the nerve center or "brain" of the Model 126.

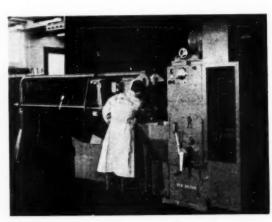
It is from this central control station that the operations of cutting off, unchucking, stock feeding stroke are governed. Preset strip cams and five limit switches positively time all these movements. The drum is divided into five sections, one for each side of the turret, and bears a scale on each feed section reading directly in inches of turret stroke.

Also mounted on the drum are five shifter arms which, during the highspeed cycle, automatically preselect any one of 10 feeds for each of the five turret stations. This automatic choice of feeds is made possible by the automatic transmission.

The program drum, then, permits the operator to set his high speed and low speed cycles, choose the exact length of feed stroke, and preselect the feeds for each of the turret stations without changing feed gears. New Britain Machine Co.

Circle E-5 on page 81 for more data





Transfer Machine for Machining Tractor Cylinder Blocks

A special machine tool of the transfer type has been delivered for machining tractor cylinder blocks.

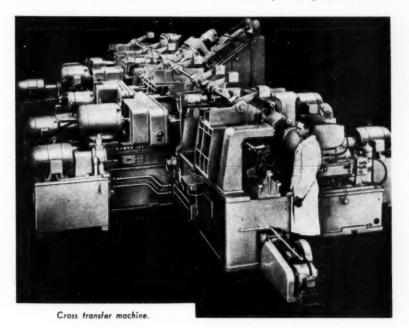
Cylinder blocks are finished at the rate of 71 pieces per hour at 100 per cent efficiency. The operations include drilling, counterboring and tapping the recess for the oil filter; drilling, counterboring and reaming two Welsh plug holes; milling, drilling, reaming and tapping the hydraulic pump mounting pad; milling, chamfering and tapping all miscellaneous holes on both sides.

The new machine has 13 stations—one for loading; one for milling; six for drilling, boring and reaming; one for tapping; four for inspection. A hydraulic power operated transfer mechanism moves the work from station to station.

Electrical and hydraulic construction is to Joint Industry Conference standards

The Transfer-matic, as the units of the transfer type are called by the maker, incorporates many automatic devices including automatic chip conveyor; automatic air-oil tap lubricating and cleansing with each cycle; automatic, gravity operated cam clamping; automatic retraction for milling cutters during return stroke. Cross Co.

Circle E-6 on page 81 for more data

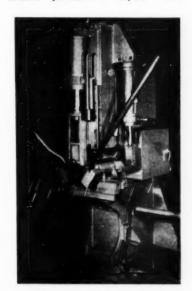


Vertical Ram-Type 20-Ton Bending Press

A vertical ram-type tube and pipe bending press, claimed to be designed with unusual working clearance for speed handling a variety of multiple bends in different planes, is in production. The press is a fully-hydraulic, self-contained unit with a rated capacity of 20 tons. Design features include twin equalizing cushion cylinders offset on the press frame, automatic angle-of-bend cycling with automatic return to starting position. variable speeds, oil coolers, single screw adjustment for wing dies, moveable foot control and shortened die holders for maximum clearance.

The unit has adequate power and capacity for repeat bending of ½ in. through two in. OD steel tubing size with a maximum wall thickness of 0.083 in. without excessive flattening, wrinkling, or distortion. Clearance is provided to bend a two in. tube with a five in. centerline radius to 180 deg. One of the primary applications of the new press is bending automotive exhaust and tail pipes, and the overall design of the press reflects the extensive research conducted in this field to meet specific requirements of automotive manufacturers.

The machine is equipped with a 10station depth-of-bend selector turret, mounted vertically on the left side of the press frame. Station settings control the various depths of bends automatically. After completing any preselected number of bends from one to 10, the turret automatically returns to the starting position. Thus, cycling through unused positions is completely eliminated, which substantially increases production output. Inter-



Pines 20-ton bending press.

changeable pick-off turrets for the depth-of-bend selector can be provided so the preset turrets for long run work can be stored as other fixtures and remounted quickly for repetitive jobs. This feature further reduces setup time and facilitates accurate duplication of previous work.

The compact design and built-in features of the press bender are said to conserve floor space. The 100 gal oil reservoir is built into the machine base, and the 20 hp, 1200 rpm motor is vertically-mounted at the rear of the machine. Hydraulic valves comply with J.I.C. standards, and are panel-mounted on a ground plate on the side of the machine. This eliminates direct connection between piping and valves and provides easy accessibility for inspection and maintenance.

Power is provided by a 2000 psi Vickers pump. Alemite grease fittings are located on the ram slide ways, the wing holder spindles, and crank pins. The press is supplied with all necessary motors, motor starters, and controls for operation on 220-440 v, three-phase, 60-cycle current. Control circuits operate on 110 v, 60-cycle, with step-down from line voltage through a transformer. Pines Engineering Co.

Circle E-7 on page 81 for more data (Turn to page 78, please)



For additional information, please use postage-free reply card on page 81

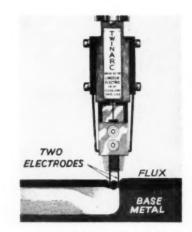
(Continued from page 77)

Hidden Arc Welding

A recent development in the application of hidden arc or submerged arc welding is said to increase the speed of automatic welding from 50 per cent up. Twinarc welding, as the development is called, employs two small electrodes in place of a single larger electrode. The two electrodes are fed simultaneously through a single head and a single jaw. Both electrodes deposit metal in the weld crater. The higher currents possible with two electrodes increase the rate of metal deposition, amount of penetration and, consequently, welding speeds.

Twinarc welding is recommended for use on butt or fillet welds in ¼ in. or thicker plate where the application is normal for automatic hidden or submerged arc welding. Typical of the speeds possible is that used in making a ¾ in. fillet weld, 15 ipm at 1500 amp.

A special electrode jaw, wire feed rolls and wire guides adapt any standard Lincoln weld head for using two electrodes. The standard single head controls are used as well as the standard d-c welding current generators. Currents up to 1500 amp can be used with Twinarc welding for which two generators may be paralleled or a single 1500 amp unit may be used. The two-wire head will feed electrodes in 5/64 in., 3/32 in. and 1/8 in. diam sizes. The two electrodes are fed down into the Twinarc jaw where the welding current is conducted into each electrode from the same contact block. Electrodes are pressed against each side of this contact block which determines the electrode spacing. This space is normally 1/2 in. but can be adjusted where necessary. Both electrodes are regulated equally by the common arc voltage control. Welding current from



Lincoln Twinarc welding head.

the common welding generator automatically divides between them.

The electrodes are normally in line along the seam but may be skewed 1/8 in. so that they are across the seam. This produces a wider bead. If a still wider bead is desired or if burnthrough is a problem, the electrodes can be run side by side. Side by side operation is recommended for poor fit-up. These electrode adjustments are the only extra adjustments needed other than those normally required for automatic welding.

In addition to increasing the speed of automatic welding, Twinarc welding is said to also facilitate welding on rusty or dirty plate, producing good welds. The Lincoln Electric Co.

Circle E-8 on page 81 for more data

Eight-Station Way-Type Boring Machine

Now on the market is a way-type precision boring machine, Model 331 Bore-Matic, with a vertical indexing eight-station fixture. The low mounting position of the fixture on the way unit is claimed to facilitate the handling of heavy awkward parts. Indexing is hand operated with location controlled by an air operated locator pin actuated by a foot valve.

Tooling mounted on a No. 218 boring head includes a cross feed unit. In-stroke operations consist of turning and plunging a chamfer, table hits positive stop and the cross feed operates with tools forming and blending two radii and generating a face.

Forty individual borizing operations are performed on each part with a total cycle time, including loading and unloading, of 12 min per part.

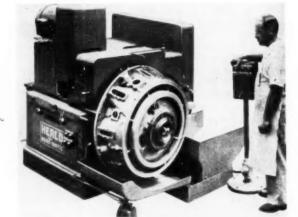
The table is interlocked with the cross feed unit so that it will not start the out-stroke until all tools on cross feed are clear of work. Also, table is

interlocked with fixture so that cycle cannot be started until part is properly indexed.

A pedestal push-button control panel allows operator to control ma-

chine at a point close to the loading station. Cycle is completely automatic after "table in" button is depressed. The Heald Machine Co.

Circle E-9 on page 81 for more data



Heald way-type boring machine.

Broaching Machine Features Unique Fixture

High versatility is the feature of a special trunnion fixture equipped horizontal broaching machine for internal broaching. Indexing, the diameter of the work, and the angle of the cut

can all be adapted to the requirements of the work piece.

The machine is basically a standard 10-ton, 90-in. stroke horizontal broaching machine. It incorporates a

fixture which allows angular adjustment (15 deg to 45 deg) for broaching a wide range of internal angular slots in jet engine segments of various diameters. Variations in diameters are accommodated by changing the internal support ring in the fixture.

An internally mounted rotor in the trunnion fixture is actuated by an index mechanism mounted on top of the fixture. This allows the work piece to be advanced in accurate increments in accordance with the work piece specifications. Angular adjustment is through a worm and segment, with positive locking. Indexing is hydraulically powered through change gears and a Geneva motion, controlled by limit switches, and locked in place by a positive plunger, providing high versatility as to amount of index.

In operation, the ring segment is mounted in the fixture, the trunnion fixture is horizontally shuttled into broaching position, the broach cuts a slot. The fixture recedes from broach cut, the broach is returned, and the part is indexed one increment. The fixture then returns to broaching position, and the process is repeated automatically until all slots are broached. The rapid traverse then rotates the part automatically to loading and unloading position. Part is ejected pneumatically. Selective electrical circuits are provided for fully automatic operation, single indexing, or independent inching motions for all hydraulic units, including both forward and reverse. Colonial Broach Co.

Circle E-10 on page 81 for more data



Lubricant

For use at temperatures of 500 deg and over, a lubricant—Hi-Temp oil 303—has been developed which is light enough to be fogged easily in automatic lubricators yet provides high load carrying protection.

This hot-spot lubricant combines molybdenum disulphide with a synthetic base and a pure, low-carbon-content petroleum oil. These properties impart high resistance to heat breakdown and reduce carbon build-up on bearings exposed to elevated temperatures.

Another feature of Hi-Temp oil 303 is its high stability. This lubricant will not separate in storage, making it particularly well-suited for automatic spray or mist dispensing equipment, according to the maker. E. F. Houghton & Co.

Circle E-11 on page 81 for more data

Magnetic Chuck

A magnetic chuck featuring multiple poles for full work surface holding area, has been added to the line of Power-Grip chucks.

This latest Power-Grip chuck has closely spaced separators which are of 0.050 in, wide brass separated by a 1½ in, wide mild steel spacer. The 100 per cent silver brazed construction results in a rigid base for precision grinding.

Advanced design of Power-Grip chucks and the low voltage winding gives uniform holding power over the entire face of the chuck. The full work surface holding area is ideal for holding large quantities of small, thin parts having small areas of contact with the chuck. (Sundstrand

Magnetic Products Co., Div. Sundstrand Machine Tool Co.)

Circle E-12 on page 81 for more data



Sundstrand magnetic chuck.



PRODUCTS.

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81



Engine Heater for Cold Weather Starting

Now on the market is a 60,000-Btu heater for liquid-cooled gasoline and Diesel engines. It reportedly may be used to pre-heat the engine, provide stand-by-heating, or to give controlled booster heating while the engine is operating.

The unit heats the engine coolant, which in turn heats the engine. The exhaust gases from the heater may be used to heat the battery and oil.

Heater action may be made completely automatic for thermostatically-controlled heating, or it may be manually controlled by the operator. It has electric ignition, an electrically-operated blower, and its own fuel pump.

The heater may be mounted on trucks, tractors, or automobiles under the hood or between the radiator and grill. Perfection Stove Co.

Circle P-4 on page 81 for more data



Double Pumps for Mobile Applications

Recently announced are two double pumps, Series V-2200 and V-3200, for mobile applications where two independent hydraulic power sources are required. Each consists of two vane type pumps in a single housing, driven by a common shaft.

The pumps are said to be particularly applicable to materials handling equipment and road and construction machinery for applications such as power steering in addition to the usual needs. Balanced pressure design and automatic adjustment of both radial and axial clearances are provided.

Ten sizes of series V-2200 pumps are available, while Series V-3200 has 16 sizes. Delivery units come in various gpm capacities. Vickers, Inc.

Circle P-5 on page 81 for more data



Air-Operated Impact Wrenches

Two additional sizes of air-operated impact wrenches have been added to a line of portable air tools for industry.

Used for driving bolts, studs, and threaded fasteners in assembly and sub-assembly operations, Model M960 has a nominal capacity for % in. diam bolts, and Model M970 (see cut) has a nominal capacity for % in. diam bolts. It is claimed, however, that these tools may be applied on sizes

of work other than those indicated as nominal capacity.

Both tools reportedly operate on air pressures of from 80 to 100 lb per sq in. A built-in air-control regulator provides for four different settings to allow for various torque requirements. The handle has an oil reservoir with an automatic lubricator for the motor. Master Pneumatic Tool Co., Inc.

Circle P-6 on page 81 for more data



Screw Shield Nut Prevents Scratches

Now on the market is a special "J" Type Speed Nut that shields the points of screws to protect upholstery and fabrics against snagging. It is also said to provide excellent protection against injury or product damage from screw point scratches.

Originally designed for the assembly of automobile seats, this hooded unit has a potential application in sheet metal work wherever projecting screw points are a possible source of injury or damage. It has a rigid integral flap curving up and back over the point of the screw where it comes through the nut. Shakeproof Div., Illinois Tool Works.

Circle P-7 on page 81 for more data

INFORMATION SERVICE

Postage-Free Postcards Are Provided Here for Your Convenience to Obtain FREE LITERATURE and Additional Information on NEW PRO-DUCTION AND PLANT EQUIPMENT, AND NEW PRODUCTS Described in This Issue of AUTOMOTIVE INDUSTRIES. Please Circle Code Numbers of Items in Which You Are Interested, Print Name, etc., and Mail Promptly for Quicker Service.

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FREE LITERATURE

Hydraulic-Air Cylinders

Now available is a brochure on a line of low-pressure hydraulic and air cylinders for double and single-acting applications. Twelve bore sizes of 1 1/4 to 10 in. are offered in 14 models. Petch Manufacturing Co.

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Leak Detection

Ready for distribution is a reprint from the September 1, 1952 issue of AUTOMOTIVE INDUSTRIES on "A Fast Accurate Method for Detecting Leaks." It was written by the manufacturer's chief engineer. Whittington Pump & Engineering Corp.

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Hard Rubber Compound

Bulletin No. 96-B describes Tempron heat and chemical-resistant synthetic hard rubber compound. It is available in molded parts, sheet, rod, tubing, and standard pipe and fittings. American Hard Rubber Co.

Circle L-3 on postcard for free copy

Ferrous Casting

Recently released is a 12-page illustrated brochure describing the manufacturer's expanded ferrous casting services. Formulae for estimating weight of castings are included. Detroit Gray Iron Foundry Co.

Circle L-4 on postcard for free copy

Rotary Pumps

Catalog No. 953 covers a line of rotary pumps for manufacturing marine, petroleum, and process applications. Complete specifications are included. Geo. D. Roper Corp.

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Decimal Equivalent Chart

Now offered is a decimal equivalent wall chart accurate to four decimal places. It is framed by 88 types of special cold-headed products. John Hassall, Inc.

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Packing Boxes

Recently announced is a booklet which describes and illustrates some 12 different styles and types of standard corrugated boxes, as well as 72 corrugated specialty boxes designed and engineered by the manufacturer. The Hinde & Dauch Paper Co.

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Machine Part Castings

Now available is a six-page folder on Colmonoy eastings for machine parts that must be durable. Standard castings include lathe and grinder center tips, centerless grinder tips, and chuck jaw inserts. Diamonds and Tools, Inc.

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Recorders—Controllers

Design and construction features of strip-chart Model S Micromax Recorder are featured in a revised, 40page catalog. Specifications of standard instruments for measurement and control are listed. Diagrams and other illustrations accompany the text matter. Leeds & Northrup Co.

Circle L-9 on postcard for free copy

Fluorescent Luminaires

A 24-page catalog (No. B-5799) on fluorescent commercial and industrial luminaires is now available. Westinghouse Electric Corp.

Circle L-10 on postcard for free copy

Copper and Brass Products

Recently announced is a file-size bulletin listing nearly 70 catalogs and technical handbooks on copper and brass products. Chase Brass & Copper Co., Inc.

Circle L-11 on postcard for free copy

Electric Tools

Recently published is a brochure on a line of electric tools for valve and valve seat reconditioning. Featured is a new valve refacer. Black & Decker Mfg. Co.

Circle L-12 on postcard for free copy

Metal Stampings

Recently published is a 24-page book on methods of improving products, reducing their cost, and extending their service life through metal stampings. The Crosby Co.

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USE THIS POSTCARD

Thread Gages

JUNE 1.

Chia

Fresh off the press is a brochure on a line of thread gages. Complete specifications are included. Standard Thread Gage Co.

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Polyester Resins

Now available is a 24-page bulletin on industrial applications for polyester resins. Included are catalysts, fillers, pigments, and principal fabricating methods used. Chemical Div., General Electric Co.

Circle L-15 on postcard for free copy

Aircraft Heaters

Vol. 3, No. 1 of "Aircraft Heating Digest" contains a feature article on "Metallurgical Aspects of Aircraft Heaters." Janitrol Aircraft-Automotive Div., Surface Combustion Corp.

Circle L-16 on postcard for free copy

Carbide Tools

Ready for distribution is a booklet describing a line of tungsten carbide tools for machining steel, cast iron, alloys, and non-metallics. Willey's Carbide Tool Co.

Circle L-17 on postcard for free copy

Polyethylene Plastic

Data on the properties, applications, and methods of fabricating polyethylene plastic are set forth in a 24-page booklet. It is illustrated with 43 photographs of materials and applications. Bakelite Co.

Circle L-18 on postcard for free copy

Clutches

Now available is a folder on a line of over-running, indexing, and backstopping clutches. Application and engineering data are included. Formsprag Co.

Circle L-19 on postcard for free copy

Roll Forming

Catalog No. 1053 outlines production procedures and advancements in the roll forming field and contains information on designing, forming, and mass producing shapes from ferrous and non-ferrous metals. Roll Formed Products Co.

Circle L-20 on postcard for free copy

Earthmoving Equipment

Recently released is a 48-page book (Form No. 325) on a line of earthmoving equipment. It also contains data on the selection of the proper type of equipment for various types of work. Photos illustrating the text are used throughout the work. The Enclid Road Machinery Co.

Circle 1-21 on postcard for free copy (See preceding page)

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82

SCHININS.

DIESEL ENGINE EQUIPMENT

for Greater Operating Economy

All of our products for your Diesel engines are engineered for your particular application and requirements. More than one-third of a century of research, intensive engineering, broad field experience with unexcelled manufacturing facilities are back of our products. We gladly offer our engineering assistance and our extensive facilities to produce and serve you



EXHAUST DRIVEN TURBOCHARGERS for engines from 70 to 200 HP, naturally aspirated output.



efficiently.

POSITIVE DISPLACEMENT SUPER-CHARGERS for engine sizes from 50 to 500 HP, naturally aspirated output, and pressure ratios of 2:1 max.





AIR STARTING MOTORS in 7½, 15 and 30 HP capacity.

AIR OPERATED, MULTI-DISC CLUTCH DRIVEN, THERMOSTATICALLY CONTROLLED COOLING FANS from 24" to 48" in diameter.

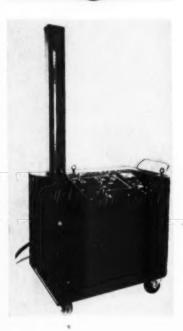
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AUTOMATIC
SHAFT SEALS

AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 81





Flight Test and Instrumentation Camera

Recently announced is a pulse-operated, variable-sequence camera for recording instrumentation in aircraft and in ground installations. It reportedly offers a maximum picture frequency of eight frames per second. Frame frequency is controlled by a timer, intervalometer, or any device which will make and break contacts.

Known as the Varitron DR-2 camera, it is composed of four basic units:

shutter and lens mounting plate (the former is electrically operated with a maximum center opening of 1% in. and has speeds variable from 1/50 sec. to 1/200 sec.); camera body and data recording chamber; film magazine; and remote control box.

Cameras are said to be capable of operation in a parallel gang. Photographic Products, Inc.

Circle P-1 on page 81 for more data

Flow Switch for Fuel Pump Lines

Designed for use in aircraft fuel pump lines, a sensitive instrument now on the market automatically reportedly provides a warning signal whenever fluid flow falls below a predetermined value. This flow switch is said to be unaffected by pressure or temperature changes, while a balanced assembly resists vibration or acceleration forces.

As fluid flow falls below a predetermined value, restoring and calibrating Alnico magnets force a pivoted aluminum vane toward a closed circuit position, actuating a hermetically sealed glass switch which operates a warning signal. Actuating position of the switch can be set at factory to indicate flow conditions at different rates dependent upon specific application requirements.

The unit is adaptable to industrial use also. Revere Corp. of America.

Circle P-2 on page 81 for more data

Portable Leak Test Units for Fluid Systems

Recently announced is a line of portable manometer leak test machines. Operating on the fall-in-air-pressure principle, the units reportedly detect leaks in complex or inaccessible aircraft fluid systems. They also can be used for leak detection in the automotive, marine, and other industries, according to the maker.

The units are said to be easily adjustable throughout the range zero to 20 psi within less than one inch H₂O and repeatable within two inches H₂O. This close air pressure regulation is provided through an arrangement of pilot-loaded free diaphragm regulators—one pressure reduction, the other for relief. The settings of both regulators are in step at each setting.

The Plexiglas door on the instrument panel, behind which the adjustment instruments are located, is equipped with a receptacle to accommodate a card certifying the pressure setting of the unit. This arrangement is said to prevent unauthorized personnel from tampering with the settings of the machine.

A manual by-pass valve for rapid filling of the receptacle to be leak-tested is provided. The relief regulator is set to relieve the full by-pass valve capacity at a pressure not more than 10 in. H₂O above the desired delivery pressure. Upon closing the manual by-pass valve, the delivery pressure returns to exact setting of the machine.

The cabinets are constructed of welded sheet metal steel and are mounted on four heavy-duty casters with solid rubber tires. Two of these casters are swivel type, while the other two are of fixed construction.

A push bar is attached to each unit, and built-in eyelets are provided for lifting. Device Engineering Co.

Circle P-3 on page 81 for more data

CONFORMATIC

PISTON

THIS STEEL
TENSION MEMBER

Maintains fitting clearance from - 20° F. to 200° F

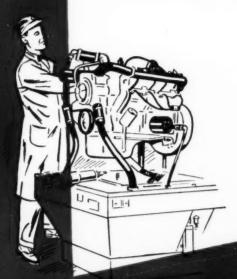
to **LESS** Clearance
...Without Danger of
Scuffing or Seizing

You get quieter engines, eliminate cold slap and reduce friction... without sacrificing piston strength or conductivity. No cold slap at temperatures as low as -20° F.... no seizing or scuffing at 200° F.

LOOK AT THESE TEST RESULTS . . .

RESULTS OF 1200 Hour CYCLE TEST

In recent cycle tests made by one of the largest automotive manufacturers, Sterling Conformatic pistons were fitted into a stock engine at .0005 clearance. After operating the engine for 1200 hours, approximately half of that time at full load and full throttle, the Conformatic Pistons were pronounced perfect.



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STERLING ALUMINUM PRODUCTS, INC. . St. Louis, Missouri

METALS

Price of Lead Turns Upward. Tin Is Plentiful, and Lower World Price Is Expected. Decontrol of Nickel Unlikely

By William F. Boericke

Still a Sellers' Market in Copper

While copper was decontrolled February 25 the action thus far has not resulted in a stable price situation and there are at present (March 15) no less than five different prices. Kennecott Copper, which produces over half the domestic supply, quotes $27\frac{1}{2}$ cents per lb, Phelps Dodge $28\frac{1}{2}$ cents, Anaconda 32 cents, American Smelting, a "package deal" of 34 cents, and Chile still holds at $36\frac{1}{2}$ cents. In addition, Rhodesian copper now arriving here in quantity, is quoted $33\frac{1}{2}$ cents f.a.s. New York.

doubtful but obviously it can't last indefinitely. Opinion in the trade is quite general that stabilization will be found at the 30 cent level. The British, who were undeniably right in 1952 in forecasting lower prices for lead and zinc, now look for cheaper copper under decontrol and are frankly bearish over the longer term. The Financial Times of London declares that copper is overvalued at present as a result of Chile's

How long this confusing situation will continue is

copper is overvalued at present as a result of Chile's insistence on receiving a 36½ cent price and believes that trading in copper futures on the London Metal Exchange would bring cheaper copper to consumers.

As was fully expected decontrol brought a flood of scrap copper to the custom smelters and receipts in February jumped up to a record 10,340 tons, the best monthly intake for many years. Custom smelters paid 27 cents per lb for No. 2 scrap which would mean a cost of about 30 cents per lb for electrolytic after processing. Refining requires about 90 days for conversion and fabricators appear unwilling to contract for metal so far ahead. They are also apprehensive over reported arrivals of some 100,000 tons of blister copper from the Rhodesian mines that have heretofore been going to the United Kingdom and the Continent where demand for the metal has recently been less insistent.

The February copper statistics showed no particular change in the demand-supply market, aside from the big increase in scrap intake. Mine output remained about the same, after allowing for the shorter month, and the daily rate of shipments to fabricators was little changed from January. However, deliveries to fabricators by producers outside the U. S. showed a substantial decline from 81,417 tons in January to 65,195 tons in February, which bears out the contention that demand abroad is definitely easier and this, if continued, will result in larger exports to the U. S.

That copper imports in 1953 will increase admits of little doubt. Final figures for 1952 show that net imports were 440,000 tons, up 110,000 tons over 1951. All of which appears to put Chile squarely behind the 8 ball. That country's insistence on receiving $36\frac{1}{2}$ cents per lb will surely run into difficulties when increasing scrap supplies, together with larger imports from Rhodesia and other countries, may permit domestic fabricators to get along without paying the Chilean government a price that appears thoroughly uneconomic and contrary to the best interests of copper producers themselves.

Lead Price Improved in March

The first cheerful news of 1953 came for lead producers in March when the domestic price was raised $\frac{1}{2}$ cent to $13\frac{1}{2}$ cents per lb, reversing a long series of price cuts that started a year ago when the metal commanded 19 cents per lb. As usual, London called the tune for the lead market and New York followed with a higher price when prompt lead on the London Metal Exchange advanced £4 per long ton to the equivalent of $11\frac{1}{2}$ cents per lb. A spread of about two cents between the London and New York prices covers costs of freight, handling, and tariff.

Disclosure that lead imports in 1952 had totalled the record breaking figure of 615,481 tons, with December imports alone at 95,000 tons, was sufficient explanation for the continued weakness in the lead price. The 1952 imports were 65 per cent more than the entire domestic mine output. While few believe that this extraordinary rate of imports can continue through 1953, it has measurably strengthened the demand for a higher lead tariff.

Buyers took heart when the higher lead price was posted and business improved. The record automobile production should cause battery makers to step up demand for lead as summer approaches. Some of the new models will require a heavier, more powerful battery. Last year replacement battery shipments totalled 22.4 million units, slightly more than in 1951, but substantially less than the 25 million units shipped in 1946-7. Battery manufacturers normally take about one-third of the total lead consumption.

Demand for Zinc is Disappointing

To the surprise of the trade, Washington has asked for limited tonnage of Prime Western zinc for the stockpile. It was generally believed that the zinc (Turn to page 110, please)

SUPERFINISH

KES THESE PARTS BETTER

... 5 WAYS!

You're looking at a group of parts that go into the Gisholt Fastermatic Automatic Turret Lathe. Super-smoothness of working surfaces of these parts is vital to the precision and long life of the machine. So all these parts are Superfinished-including overhead pilot bars, piston rods, hydraulic control valves, thrust collars, turret locating pins and rollers.

The benefits are many:

- 1. Superfinishing removes all chatter marks, grinder flats, "smear metal" and other surface irregularities.
- 2. It assures more nearly perfect geometrical forms. This means more uniform bearing surfaces. They therefore last far longer.
- 3. Superfinishing simplifies assembly because the surfaces are down to true "base metal"...and no break-in tolerances are
- 4. Superfinishing simplifies grinding and reduces spoilage.
- 5. The greater degree of smoothness makes the parts easier operating, reduces wear.

The net result of Superfinish here—as it can be in your case is parts that perform better, last longer and cost far less in the long run. See how Superfinish can solve your problems of both wear and surface roughness. Get your copy of "Wear and Surface Finish," and complete textbook covering all phases of Superfinish.



represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts.
Your problems are welcomed here.







Model 52-A General-Purpose Superfinisher

Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

Observations

By Joseph Geschelin

Sweden's Advances

Those who have had an opportunity to visit foreign motor car plants cannot fail to observe the obvious influence of advanced production methods. Volvo, doubtless the largest automotive manufacturer in Sweden, has in operation an impressive "Rotodip" installation for cleaning and Bonderizing complete body shells, automatically at the rate of around 90 body shells a day. The unit runs about 263 ft in length, and is 23 ft wide. While moving on the conveyor, the body shell is rotated, dipped, and finally sprayed. In addition to metal cleaning and phosphating, the body goes through a dry-off oven, then is immersed in a paint dip tank for the prime coat, and finally goes through a drying oven. The entire cycle, including application and drying of primer in this installation takes two hours.

Block Broach

A production man with some decades of experience in the automobile industry told us recently that he has designed a unique surface broaching machine for broaching the various surfaces of cylinder blocks, using a vertical type machine with automation. Obviously, his claims of less power, considerably less weight, and lower cost to the user will require proof after an experimental machine has been built.

Engine Additives

At least once or twice each year we check automotive laboratories regarding the efficacy of proprietary packaged additives recommended for top cylinder lubrication or for use in the crankcase. The rather positive stand of the lube specialists may appear to be a prejudice. But if it does seem a prejudice, it is an attitude based upon a great many years of study of countless formulations. The gist of it appears to be that automotive experts have been unable to find scientific proof of the efficacy of the general run of packaged additives. By the same

token, they rarely find that these formulations can harm an engine. Apparently, the only one who loses is the car owner who makes the investment. After checking so many times, for so many years, we have finally reached a definite conclusion. Our conclusion is that the marketers of branded additives should make a concerted effort to prove by controlled test programs the favorable claims for their products. Such tests, if conducted under controlled conditions. might go as far to change the thinking of automotive engineers and could be instrumental in widening the market considerably.

Engine Programs

In travelling about the country in recent months we have seen tangible evidence of production equipment for new engines being readied for delivery. At the present writing the indications are that Pontiac and Chevrolet are making good headway on tooling programs for V-8's. We have also noted some activity on V-8's for Packard.

Unique Drive

On a recent trip to Rockford we spent some time on a demonstration of a car equipped with the Dualock differential, a device which has been seen in Detroit for several years at the SAE Annual Meeting. The promoters of this unique differential have prepared a praiseworthy color film showing demonstrations of the car on snow, on ice, in mud, and generally under adverse conditions that would

mire and stop any normal automobile. Yet the car equipped with this differential was able to handle the situation quite competently and without getting into trouble. Despite the higher cost of this unit, as compared with a conventional differential, the obvious safety it offers may well be worth the difference to the motorist.

Bearing Failures

At the recent meeting of the API Lubrication Committee in Detroit, H. W. Luetkemeyer, of Clevite, presented a paper dealing with an analysis of engine bearing failures. Excessive engine dirt is given as the principal cause of premature failure. According to the author, in addition to wearing and abrading the bearing, foreign particles lead to high operating temperatures, lower fatigue life, interrupted oil film, wiping and seizure.

Engine Lubes

Still better engine oils will be required in the future if the present trend to higher compression ratios and greater output continues, according to Earl Bartholomew, Ethyl Corp., in a paper presented at the API Lubrication Committee meeting in Detroit. To meet the ever increasing demand for better performance, present properties of engine lubes must be improved and desirable new properties added. Additivies, now being used to the tune of more than 800,000,000 lb annually will find an even more important role in the future, according to Bartholomew.

Mulford Is President of Engine Group

The National Association of Engine and Boat Manufacturers recently announced the election of John W. Mulford, president of Gray Marine Motor Co., to the presidency of the association. He successeds George Codrington of General Motors Corp.

Gray Marine displayed 14 units at the recent National Boat Show in New York, while Gray engines powered nearly half of all inboard boats on display. A cutaway of the new Phantom Four-75 four-cyl engine with counterweighted crankshaft was shown for the first time. Other Gray exhibits included its new light 100-hp Diesel with aluminum housings, oil pan and manifold, and the Continental Turbomeca gas turbine, first of its type ever to be exhibited at a New York boat show.

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Connecting Rod and Piston AUTOMATION

(Continued from page 67)

into four different weight categories, eject the graded parts onto the proper place on the partitioned belt conveyor for transport to suitable pallet boxes.

As the pallet boxes for grades 2, 3, 4, and 5 become filled they are picked up by means of lift trucks and delivered to another of the big Lapointe duplex vertical hydraulic surface broaching machines. This one, of 15/66 rating, rough- and finishbroaches the joint face as well as the half-round bore in one setting. Here again there are two fixtures, each holding two pieces. However, this broach is designed to produce caps of equal weight as well as finish to size. To facilitate this, the operator is provided with four master caps corresponding to the degree of overweight. The master cap enables the operator to adjust the work-holding fixture for proper depth of cut so as to remove sufficient weight from each cap to effect substantially equal weight for all finish-broached caps.

Following this operation, bolt holes are drilled, chamfered, and rough- and finish-reamed in the well-known eight-station Davis & Thompson Roto-Matic drilling machine. This machine is hand loaded and unloaded, and finished parts are loaded by hand onto the automation conveyor for the next operation. Next comes milling of the bearing liner anchor slot in a Griffin continuous rotary milling machine.

Final stage is rough- and finishspotfa ing and chamfering of the two bolt holes, this being done in a six-station Davis & Thompson Roto-Matic, provided with automation.

The connecting rod, naturally, requires many more operations on the machine line. Forgings are given a sampling check in a Magnaflux machine to detect the possible presence of minute surface imperfections. Then they are rough- and semi-finish-ground in a five-wheel, No. 100 Mattison surface grinder. This is a double-index operation since each part must be removed from the fixture and turned over by hand to finish the opposite side,

Grinding is followed immediately by sorting automatically into eight weight classifications in a special Toledo scale eight-station set-up. In this case, the first and last stations reject underweight and overweight forgings, respectively. The major part of the load is then graded automatically into six grades by weight, the parts being ejected onto the conveyor belt and dumped into suitable pallet boxes. As a pallet box becomes filled it is transported by means of a lift truck directly to the broaching machine.

Semi-finish broaching of the joint face and rough-broaching of the half-bore at the crank end is done in one pass in an enormous Cincinnati 15/66 Duplex Hydro-Broach. As in the case of the cap, each rod is matched for weight against a suitable master rod, the fixture being suitably adjusted for the depth of cut required to give substantially equal weight. The machine is fitted with two fixtures, one for each ram, each fixture holding two rods.

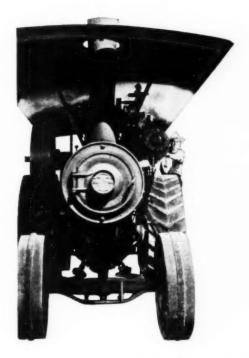
A Baker vertical seven-station automatic drilling machine does the drilling, chamfering, and reaming of the piston pin hole, handling three rods at each station of the indexing table. Drilling of the piston pin hole is done in three stages at three stations.

A 10/54 Cincinnati Duplex Hydro-Broach of vertical type follows next on a detail broaching operation. The work is then placed on the belt conveyor and moved to a Blanchard surface grinder for semi- and finishgrinding of the joint face.

Drilling and rough- and finishreaming of bolt holes at the crank end takes place in a Davis & Thompson Roto-Matic. A five-station Kingsbury semi-automatic cycle indexing machine is set up for milling the anchor slot and drilling two small diameter squirt holes. Next operation is that of milling the bolt head stop and chamfering the bolt holes in a six-station Davis & Thompson Roto-Matic. Final operation is that of inserting, burnishing, and chamfering a bronze bushing in the piston pin hole and drilling an oil hole in a twostep operation on a special Ductomatic indexing machine,

Following the machining stages mentioned above, the rod and cap are made up as a sub-assembly and joined with the fastenings. First machine operation on the sub-assembly is rough- and semi-finish boring of the crankpin bore in a Kreuger single-

(Turn to page 108, please)



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Reinforced Plastics Conference

(Continued from page 55)

often runs five to 10 per cent in the manufacture of reinforced plastics items. Various ways of separating the glass fiber are employed. A general purpose hammer mill with a large screen is employed by one molder.

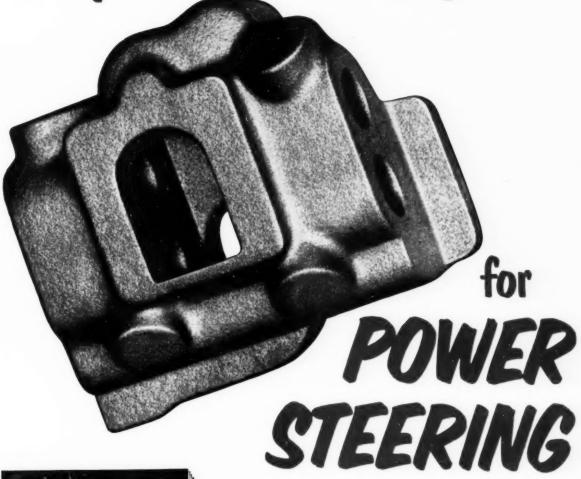
The resins employed again vary. Combinations of medium viscosity and high viscosity or partially reacted polyesters are frequently employed to obtain stability and freedom from segregation in the mix as the molding temperature is raised. This problem of resin thinning with rising temperature is likely to be present when the laminating type resin is employed, and care must be taken by the molder to prevent segregation of resin and glass especially in complex shapes. The amount of filler, usually clay, employed depends upon the application. Where cost is paramount, the clay content is increased and often runs as high as 55 per cent or more. The increased clay content reduces costs and imparts ease of molding, but at the same time in large amounts it generally lowers the mechanical and physical properties of the material.

Reinforced Plastics in Aircraft Design By Major W. G. Ramke Wright Patterson Air Force Base

In order to establish design criteria for aircraft structural parts, the mechanical strength properties of plastic laminates are being determined for existing materials and also for improved new materials as soon as they are developed sufficiently to be considered for aircraft uses. These mechanical strength properties are being determined over a wide temperature range and include short time tension and compression, shear, bearing, fatigue, and creep rupture. A large amount of these data have been obtained on existing materials and are being included in the Aircraft Plastics Bulletin, ANC-17. Design data are also being obtained on plastic sandwich construction for inclusion in Sandwich Construction for Aircraft Bulletin ANC-23. In tensile and compressive stress tests versus temperature curves after 1/2 and 200 hr exposure at the test temperature for a moderately heat resistant polyester resin laminated with 181-114 glass

(Turn to page 94, please)

Eaton Permanent Mold Gray Iron Castings-





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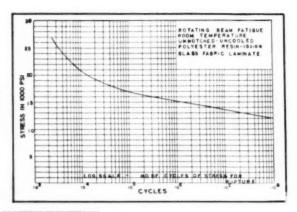
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Reinforced Plastics Conference

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fabric, it was noted that the compressive strength is decreased considerably more than the tensile strength by increased temperature. This is to be expected since the compressive strength of a laminate is dependent on the resin to a much larger degree than on the glass fabric reinforcement, which is not the case of the tensile strength. The temperature effect is

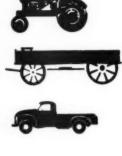
Fig. 1—Typical fatigue curve for a low pressure polyester resin laminate.



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more severe on the resin than on the glass fabric.

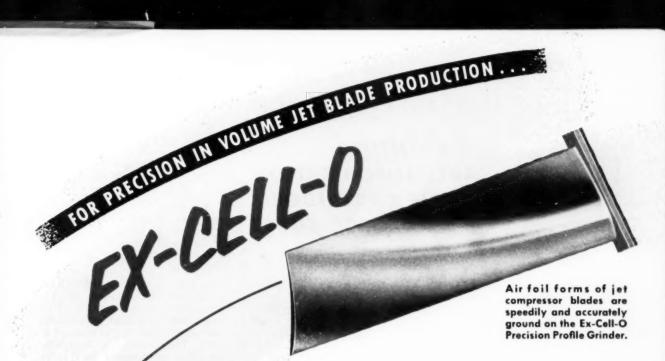
A typical fatigue S-N curve is shown in Fig. 1, for a polyester resin laminate conforming to Specification MIL-P-7575 Resin, low pressure laminating. It has been found that in general the fatigue strength at 10 million cycles of an unnotched laminate specimen in axial loading, when tested at standard conditions with a mean stress of zero, is approximately 25 per cent of the static or short time tensile strength. A notch in the specimen reduced the fatigue strength only approximately four or five per cent. High humidity conditions decrease the fatigue strength in the range up to 10 thousand cycles but above this point the curves coincide. The heat generated in the laminate specimen at the higher stresses decreases the fatigue strength but at lower stresses where failure occurs above 10 thousand cycles there is no effect. Tests made at a mean stress of one-half of the static tensile strength of the laminate have shown that the fatigue strength at 10 million cycles is about one-tenth that at zero mean stress, or approximately two per cent of the static tensile stress.

The creep rate of these materials is extremely small or practically nil as illustrated by Fig. 2 for tensile loading. Initial loading produces the deformation after which there is practically no creep either at room or elevated temperatures until failure, which occurs abruptly. Compressive loading produces a slightly higher creep rate than tensile loading. For instance, at 300 F with a compressive load of 10,000 psi, the minimum creep rate was 0.00050 per cent per hour. the initial deformation being 0.33 per cent and the final deformation being 0.54 per cent.

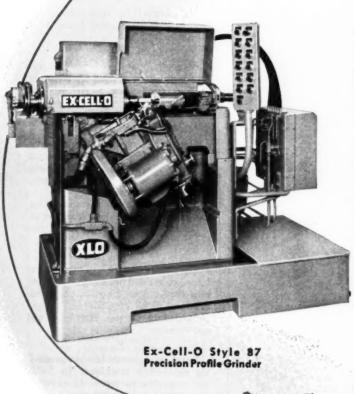
Typical polyester glass fabric laminates have been evaluated at temperatures as low as $-196\,$ C. The

(Turn to page 98, please)

1



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ment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure continued satisfaction with Markem methods and equipment.

When you have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem method has already been developed to solve your problem. If not, Markem will work out a practical solution.

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In 1960, U.S. scheduled airlines operating on domestic and international routes-should carry more than 45 million passengers. an increase of 84 per cent over 1951. They should fly more than 25 billion passenger miles, an increase of 92 per cent over 1951, and transport over 127 million ton miles of mail and more than 478 million ton miles of cargo.

Passenger car registration increased 66 per cent from 1945 through 1951.

More than half of a typical patrol bomber produced by a major U.S. aircraft manufacturer is built by other companies, including 3000 small businesses.

The average workers' real wages per hour will double in the next 30 years, if the productivity rate of the last 50 can be maintained.

Two jet fighters now use as much fuel as an entire World War II fighter squadron flying the same mission.

Corporate profits taxes have been increased three times since mid-1950. The average federal tax load of all corporations is approximately 60 per cent of their net income.

Total manpower losses caused by on-the-job accidents in 1952 are expected to equal 12 months of idleness for 140,000 men.

The U.S. Bureau of Public Roads reports that 23 states indicate the average speed of all vehicles in 1951 was 49.0 mph. The corresponding average speed in 1950 was 47.6 mph.

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Reinforced Plastics Conference

(Continued from page 94)

Charpy and Izod impact strengths are practically the same at this temperature as at room temperature. Other mechanical properties such as tensile, compressive and fatigue are generally higher at -196 C than at room temperature. It has been found that rapid cycling between these tempera-

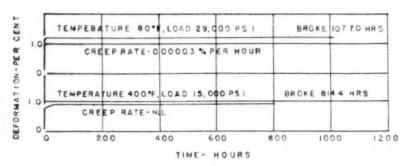


Fig. 2—Time-deformation curves for typical polyester glass fabric laminate.



ture extremes of flat sheet specimens containing various types of notches does not produce any cracking or warping of the laminate or crazing of the thin layer of surface resin.

Effect of Moisture Absorption By Jay M. Stevens

By Jay M. Stevens Materials Engineer

Materials Engineer, Department of the Navy

THE marked decrease in strength of polyester laminates upon exposure to moisture has been a deterrent to their extensive use in aircraft structures. Figure 1 shows the maximum and minimum effect of moisture absorption on the flexural properties of a 181-114 polyester resin laminate after prolonged exposure of the laminate to various temperatures and relative humidities. It will be noted that while the modulus of elasticity was not affected by the absorbed moisture, the modulus of rupture was decreased by as much as 30 per cent when the specimens had absorbed 0.9 per cent of water based on their conditioned

Because of this strength loss, considerable importance is attached by the military services to the recent development of improved finishes or chemical treatments for glass fibres, such as Garan, Owens Corning 136, Bjorksten, Linde and Volan. The more uniform wetting achieved with these finishes enables the manufacture of glass fabric reinforced polyester resin laminates which will consistently retain better than 90 per cent of their dry strength after prolonged exposure to moisture. Present indications are that it may eventually be possible to improve performance to the point where no loss in mechanical strength will occur upon exposure of the laminate to moisture.

To insure that the plastic laminated structures employed in military air-

(Turn to page 100, please)

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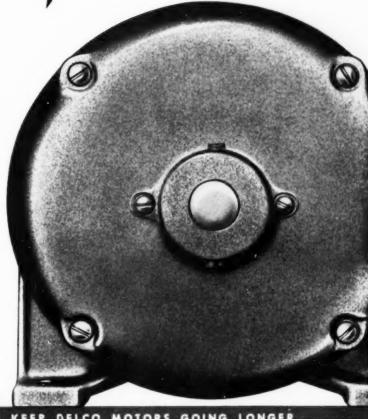
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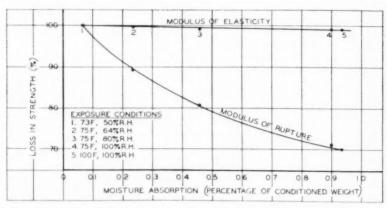
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(Continued from page 98)

craft will have maximum possible durability, applicable specifications are being revised to require that only glass fabrics treated with one of the improved finishes shall be used in the fabrication of structural laminates for aircraft.



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Fig. 1. Maximum and minimum effect of properties of a 181-114 polyester resin laminate after exposure for 72 days to various temperatures and moisture absorption on the flexural relative humidities.

Machining Axle Shafts

(Continued from page 68)

release a force of 4200 lb for chuck actuation when triggered. This force locks the chucks securely to the shaft for driving. Altogether there is an assembly of 12 chucks and six power cartridges.

One of the features of these machines is the fact that this long shaft is loaded with the spindle turning and as it is chucked it is immediately brought up to a spindle speed of around 1000 rpm, ready for cutting. Metal removal is extremely fast. Neglecting variations in rough forging size, average chip removal is about ½-in, on the diameter. Metal cutting is done wet.

For unloading, the mechanism at Station 5 has an ejector device which grasps the shaft, withdraws it from the chuck, and transfers it to the unloading station where it is removed by the operator.

All of the chip removal, except thread chasing, is done with carbide tools. It is noteworthy that for the most part, Chrysler employs triangular, solid carbide tools which provide six new cutting edges before regrinding is necessary. Noteworthy too is the arrangement for salvaging these tools. As a solid carbide block wears down, after repeated grinding, the small remaining section is welded to a piece of carbon steel, thus making it possible to use the carbide right down to the smallest usable piece. In this form, of course, the tool has only three cutting edges.

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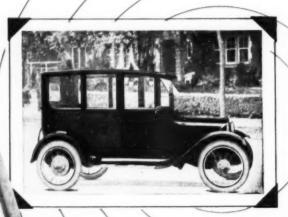
DETROIT UNIVERSAL JOINTS





UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

another case where welded steel tubing does the job best ...



HOW

we took the rumble out of grandpa's sedan...

• Remember the rumble and roat that began when the old-style drive shaft under the floor started vibrating and whipping at 40 MPH.?

Today's automobiles can travel at twice Grandpa's speed with never a whisper of whip and rumble from the propeller shaft. Many such shafts are Republic ELECTRUNITE Tubing...uniformly round, fully concentric, with uniform wall thickness all around the tube and from end-to-end. There can be no heavy spots or light spots to throw the rotating tube out of balance.

Another advantage . . . Republic ELECTRUNITE Tubing has plenty of strength to withstand the reversal of torque when you release the accelerator and change from engine-driving to engine-braking conditions. The uniform walls of the light-and-strong hollow steel tube can "take" this twist for hundreds of thousands of miles.

This propeller shaft should give you the idea that welded steel tubing made the Republic ELECTRUNITE Way can take a lot of punishment . . . and come back for more. We'd like to tell you all the things that Republic ELECTRUNITE Tubing is doing successfully, and at lower cost. Write to:

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SAE Meeting Highlights

By Joseph Geschelin

Many Design and Engineering Problems Discussed at the Society's National Passenger Car, Body and Materials Sessions in Detroit

YMPTOMATIC of current trends in motor car design, Firestone described the development of a 100-mph tire now in production for passenger car use. Increased engine output, introduction of new high performance V-8 engines and constantly accelerated performance ability of modern cars now require tires capable of operation at speeds of 100 mph, and demand brakes capable of matching increased deceleration rates with the enhanced accelerating ability of the vehicle.

These considerations, together with other features such as air conditioning, and valve gear problems associated with the incidence of overhead valve V-8's, provide the background for the excellent papers presented at the SAE National Passenger Car, Body, and Materials Meeting held in Detroit, March 3, 4 and 5. Nor is the choice of subjects surprising when it is considered that E. N. Cole, Chevrolet chief engineer, general chairman of the meeting, and his group of high powered associates have been in the forefront in bringing these new developments to fruition.

J. J. Robson, Firestone Tire & Rubber Co., described 100-mph tires. He showed results of laboratory and field testing indicating that high speed performance of conventional tires is limited by a surprisingly sharp increase in tire temperature at speeds above 80 mph. Investigation shows that this rise in temperature, in a matter of a few minutes, and attaining temperatures capable of devulcanization appears to be due to so-called traction waves which persist in the form of a damped wave over a considerable arc of the tire tread.

The new type high speed tire is of such design as to eliminate traction waves at 100 mph, although this dynamic action is again encountered at a speed range beginning with 110 mph. The new tires are built with stronger, heat resistant rayon cords. Incidentally, tire makers are recommending four to six lb additional inflation pressure with high speed tires as an aid to stability as well as tire life.

Better brakes with greater stopping ability and relief from fading at high speeds were discussed by G. T. Ladd, Fairchild Engine & Airplane Corp., and S. B. Dew, Wellworthy, Ltd., England. Starting with the premise that current brake systems are operating

(Turn to page 104, please)

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cooler, Model TC-3, is compact,
light in weight and ruggedly
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Young-built fluid coolers were original equipment on some of the first torque converter installations, and have been thoroughly tested under actual operating conditions. Illustrated above is one of three types of coolers now in service on the nation's "big name" equipment. Their shell and tube bundle design means easier maintenance—longer, more efficient service without clogging. Check with Young Engineering Service on your specific requirements; Young standardized units pay-off in low-cost heat transfer.



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SAE Meeting Highlights

(Continued from page 103)

at maximum capacity at high speeds, the authors proposed the adoption of aluminum alloy bi-metallic brake drums in combination with disk brakes for all manner of motor vehicles. Air-cooled brake systems incorporating cast iron shoes bonded to aluminum alloy brake drums are said to have superior cooling ability, ease of operation, and freedom from

With higher speeds, attention needs be drawn dramatically to the effect of sidewinds and gusts on the stability of motor cars, according to W. E. Lay, University of Michigan, and Dr. P. W. Lett, Jr., Chrysler Corp. Stemming from extensive wind tunnel and road testing, the following conclusions have been drawn by

"1. As the resultant wind direc-

tion changed from head-on, the total sidewise force exerted on the test car by the wind was shown to increase at a significantly greater rate than the cross sectional area of the car normal to the wind. This effect was most pronounced where resistance due to turbulence was most significant, i.e., for resultant wind angles within 10 deg of head-on.

"2. The center of pressure of a resultant wind striking the car was shown to move toward the center of gravity from a location forward of the center of gravity as the direction of the wind shifted from head-on to the side.

"3. The tendency of the car to yaw was shown to be most affected by small changes in resultant wind angle from a head-on direction.

"4. A gust striking the car at an angle to the direction of travel was shown to cause a sudden lateral displacement and to turn the car from its direction of travel. Corrective action of the driver stopping the car in its sidewise movement and turning it into the gust so as to regain the direction of travel was responsible for the greatest forces recorded during a gust interval.

"5. Whether gusts or sidewinds strike a moving car its aerodynamic stability will be determined primarily by: (a) the degree to which lateral thrust forces due to winds are equalized between front and rear wheels, and (b) the extent to which the air resistance of the car to winds from the side is reduced. Additional cross sectional area rearward of the center of gravity and normal to crosswinds would reduce the distance between the center of pressure and center of gravity for present day cars and definitely improve stability in winds. Body design is the key to aerodynamic stability."

Various phases of air conditioning automobiles were explored in three papers at this meeting. P. J. Kent. executive engineer, Chrysler Corp., predicted that within five to 10 years one out of 10 new cars sold would be equipped with air conditioning, despite present conservative estimates of the situation. He feels that in the future salesmen, doctors, and others who spend a good part of their daylight hours on the road will demand air conditioning, particularly where the added cost may be charged as a business expense. It is particularly a must in areas subject to hot, dry or humid climatic conditions.

Design and performance characteristics of the Frigidaire air conditioning system for motor cars were given

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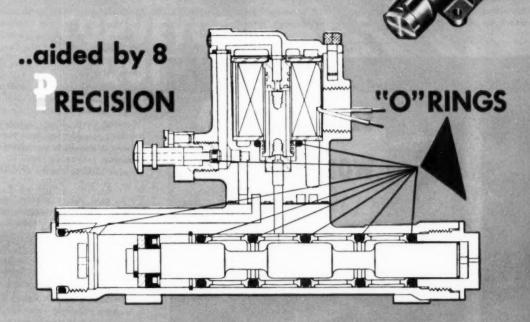
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in detail by M. W. Baker and D. C. McCoy, Frigidaire Div., GMC.

Apart from the design of air conditioning equipment and its appeal to the car owner there are special problems associated with its installation in the car. Should it be installed on the car assembly line, or off the line, or by the dealer. These questions were discussed by H. V. Joyce, Ford Motor Co., as problems for top management decision. Because of the complication of the installation, it seems almost imperative to introduce it either on the final line or off the

line. While this procedure can be justified on economic grounds, some of its advantages may be lost by the requirement of additional floor space off the line; and a slowing down of the final assembly line if the job is done right on the line. Moreover, if this installation were to be strictly seasonal, that would complicate matters still further.

The other alternative is to make it a dealer installation. While this may be expedient in some operations, it would increase the cost to the car buyer through extra installation cost and payment for extra parts. Moreover, it would delay car delivery by two or three days on the part of the dealer. Finally, it would demand special facilities and special training of skilled mechanics to handle the job at all.

The same problem was touched by Kent in his paper. He mentioned that Chrysler has organized a special school for instruction in the design, operation and installation of air conditioning. He stated that Chrysler does not plan field installations during the first year but implied that as dealers become more familiar with the systems some of the larger dealers may plan to make their own installations.

Man-made synthetic fibers that can outlast the car were described by G. P. Carver, Jr., Bachman Uxbridge Worsted Corp. These upholstery materials should outlive woolen-type fabrics about 10 to one, have greater abrasion resistance, and be less expensive although more attractive.

W. F. Bird, Collins and Aikman Corp., said that synthetic upholstery materials have brought about a "luster" revolution in the styling of interiors. Eight synthetic fibers now in production can be used in combination with natural fibers to provide a choice of some 3000 different materials.

The session on valve gear problems in modern overhead valve engines was easily one of the most important to engine designers. Five papers summarized different phases of the subject, including a very practical discussion of hydraulic tappets — why they work, and what to do if they don't, by Carl Voorhies, Chicago Screw Co. It deals with service problems, some obscure, others quite well known and how to overcome them through subtle changes in design.

Other papers on the subject of valve gearing were presented by Ralph P. Horan, Eaton Mfg. Co.; Calculation of Valve Motion, by Philip Barkan, Pennsylvania State College; Designing Cam Profile for Low Vibration at High Speeds, by R. A. Roggenbuck, Ford Motor Co.; and Valve Seat Distortion, by John A. Newton and M. J. Tauschek, Thompson Products, Inc.

International Nickel Co. is continuing its long-time project on corresion and presented its latest findings in a paper by F. L. LaQue on the subject of autobody corrosion. The severity of corrosion in automobiles is subject to terrific variations due to climatic conditions, being most severe





CAST IRON CHIPS

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Let's assume you're a Conveyor-Project Engineer employed by Hapman -

QUESTION 1-Which materials in panel would you advise can be efficiently handled by Hapman Tubular Sealed-pin Chain Conveyors?

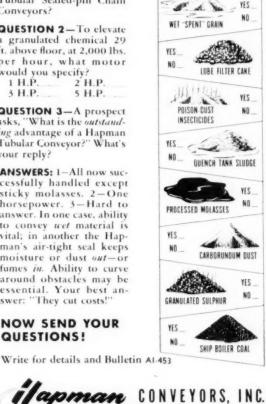
QUESTION 2-To elevate a granulated chemical 29 ft. above floor, at 2,000 lbs. per hour, what motor would you specify?

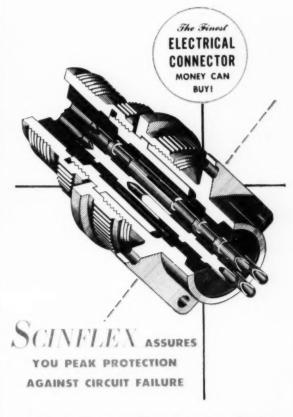
1 H.P. 2 H.P. 3 H.P.

QUESTION 3-A prospect asks, "What is the outstanding advantage of a Hapman Tubular Conveyor?" What's your reply?

ANSWERS: 1-All now successfully handled except sticky molasses. 2-One horsepower. 3-Hard to answer. In one case, ability to convey wet material is vital; in another the Hapman's air-tight seal keeps moisture or dust out-or fumes in. Ability to curve around obstacles may be essential. Your best answer: "They cut costs!"

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LaQue points out that whereas a four-coat finish system may be generally applied on the outer surfaces, the protective coatings underneath the car are definitely inferior. Only the good sound-deadening coatings sometimes applied to the underbody and fenders offer improved protection.

A discussion of laboratory work with coatings for bumpers and decorative parts was presented by D. M. Bigge, Chrysler Corp.

What alloy should the designer use for die cast decorative parts—zinc, aluminum, or magnesium. This intriguing evaluation of competitive materials was developed by M. R. Caldwell and C. Pack, Doehler-Jarvis Corp. They point out that regardless

of the prime cost of the basic material at any given time, it is important to weigh each application on the basis of design, die life, die cost, productivity, and finishing costs. Besides relative costs of electroplating the various types of alloys, attention is drawn to the variations in their corrosion resistance under certain operating conditions. The gist of the argument is that the designer should consult with die casting specialists and get their advice before an application is frozen or an alloy selection made.

A monumental point-by-point analysis of the engineering features of 1953 cars was developed by W. F. James, Fram Corp. Proceeding from the major dimensions of the cars, it touches on engine parts comparisons, valve gear, transmissions, axles, tires, brakes, etc. The author presented comments on every component of the automobile in a clear, concise manner.



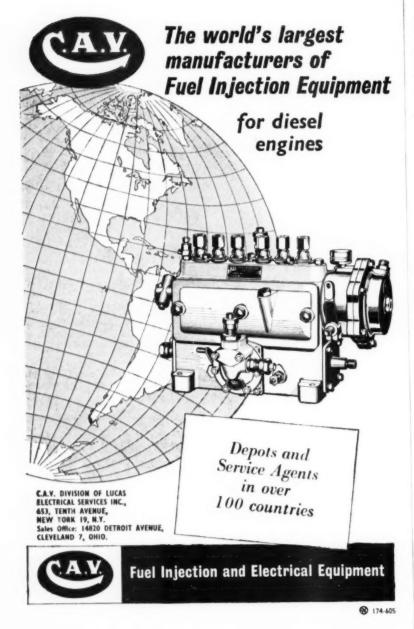
(Continued from page 90)

end, angular four-spindle boring machine, having eight positions. Both ends of the rod then are weighed and milled to standard weight in the familiar Motch & Merryweather duplex type weight-milling machine, provided with automatic clamping means. Using cemented-carbide-tipped milling cutters, the machine is arranged to hold weight at the piston pin end to a maximum variation of four grams; the crank end to 10 grams.

Both ends of the rod are semifinish- and finish-ground to size in a three-wheel Blanchard surface grinder.

An Ex-Cello-O special three-way, four-station horizontal machine is used at this stage to precision-bore the piston pin hole and crankpin bore, and chamfer both sides of the big end at the last station. Crankpin bore is held to a total tolerance of 0.0020 in., while the wrist pin hole is held to a total tolerance of 0.0003 in.

The last major operation is the honing of the crankpin bore to a total tolerance of 0.0008 in. This is done in one of the new Micromatic Turret-Hone machines of six-station type.



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METALS

(Continued from page 86)

stockpile was amply large for defense purposes and the recent request was designed to put Government support under the present price which has resulted in closing down scores of small zinc mines in the West. It appears doubtful if many producers will want to contract at the present 11 cent price, which is unprofitable for the majority of zinc mines.

Aluminum Producers Hold The Price Line

Decontrol of aluminum was expected to result in a price increase as it did for copper but not to the same violent extent. However, aluminum producers held to the 20½ cent price allowed by OPS in January which at that time did not meet the full expectations of the producers. By maintaining this price, aluminum is in a more advantageous position than ever to compete with copper in several of its fields.

Plenty of Tin

World mine production of tin in 1952 now is estimated at 171,200 long tons, up about 2500 tons from 1951. World consumption, on the other hand, was only 127,500 tons against 137,000 the earlier years. Price controls are off. Bolivia is asking for a higher price but, with supplies more than ample, the chances are poor for receiving it unless political considerations intervene. The U.S. stockpile of tin is regarded as ample. U. S. consumption of tin in 1952 was only 44,500 tons, largely because Government restrictions on its use forced consumers to look for substitutes, in which they appear to have been successful. The outlook is for a lower world price.

No Decontrol of Nickel Likely

While the supply of other metals is steadily easing—in some cases to an uncomfortable degree—there are no signs that nickel will be anything but scarce for a long time ahead. Total consumption in the U. S. in 1952 was about 101,000 tons, which signifies very little, as much more would have been used had it been available. NPA estimates that stockpiled nickel plus current output would be used up in one year, based on projected needs

(Turn to page 116, please)



Glass has a smooth, abrasion-resistant surface — won't scratch or pit. Glass never deteriorates. It retains its original strength and clarity under all kinds of weather and wear. Glass won't stain or corrode. Chemicals used on the highway don't damage it. And glass can't warp, shrink, burn or rust.

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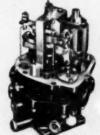
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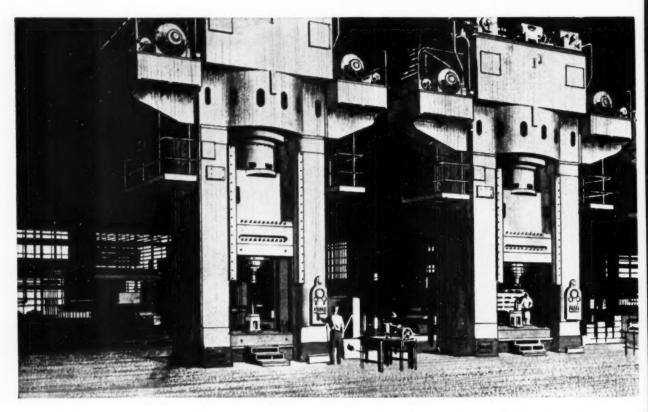
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Because the Mullins Steel Koldflo Process is so new, the question "What is Koldflo?" has been asked us many times. To answer this question, we have prepared a booklet entitled "Product Design Guide."

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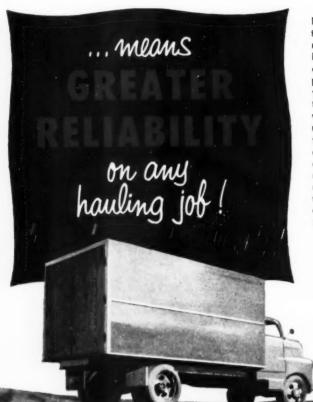
These six giant presses are the beginning of the Mullins Steel KOLDFLO commercial production facilities.



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Steel KOLDFLO Process with a definite savings in steel, manpower, machine tools, plant space and dollars.

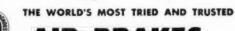




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CALENDAR

OF COMING SHOWS AND MEETINGS

- 2nd Annual International Motor Sports Show, Grand Central Palace, New York, N. Y....Apr. 4-12
- Spring Manufacturing Conference, American Management Association, Hotel Statler, N. Y. C...Apr. 8-10
- 9th Annual Meeting and Show, Metal Powder Association, Hotel Cleveland, Cleveland, O. Apr. 20-22
- SAE National Aeronautic Meeting and Aircraft Engineering Display, Hotel Statler, and Aircraft Production Forum, Hotel Gov. Clinton, New York, N. Y. Apr. 20-23
- 22nd National Packaging Exposition & Conference, American Management Association, Navy Pler, Chicago, III. Apr. 20-23
- World Auto Show, Municipal Auditorium, Long Beach, Calif. Apr. 22-26
- Annual Turin Automobile Show, Turin, ItalyApr. 22-May 3
- British Industries Fair, London and Birmingham, England. Apr. 27-May 3
- American Society of Mechanical Engineers, Spring Meeting, Deshler-Wallach Hotel, Columbus, O. Apr. 28-30
- 9th Annual Forum, American Helicopter Society, Mayflower Hotel, Washington, D. C. May 14-17
- Fifth Materials Handling Exposition, Convention Hall Philadelphia, Pa. May 18-22
- Society for Experimental Stress Analysis, Spring Meeting, Hotel Schroeder, Milwaukee, Wis., May 20-22
- Society of Photographic Engineers, Third Annual Conference, Hotel Thayer, West Point, N. Y. May 20-22
- American Gear Manufacturers Association, Annual Meeting. The Homestead, Hot Springs. Va. May 30-June 3
- 1st Annual Michigan Motor Show, State Fair Grounds, Detroit..June 2-7
- SAE Summer Meeting, The Ambassador and Ritz-Carlton, Atlantic City, N. J. June 7-12

4

- 2nd International Aviation Trade Show, Hotel Statler, New York, N. Y. June 9-11
- Exposition of Basic Materials for Industry, Grand Central Palace, New York, N. Y. June 15-19
- 14th Iowa Management Course, State U. of Iowa, Iowa City. June 15-27
- 20th International Aeronautical Meeting, Le Bourget Field, Paris, FranceJune 26-July 5
- American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J...June 29-July 3
- Sixth Annual International Aviation Exposition, Detroit, Mich. . . July 9-12
- National Aircraft Show and 60th Anniversary of Powered Flight, Vandalia Airport, Dayton, O., Sept. 5-7

Diesel Compounded for Aircraft

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The engine comprises a valveless two-stroke Diesel engine to which is added a turbine-compressor set. The axial-flow compressor is on a common shaft with a multi-stage exhaust turbine, and the turbine-compressor set thus formed is coupled mechanically to the compression-ignition engine through suitable gearing. Power is transmitted to a common, single rotation propeller shaft by a reduction gear in the nose of the engine.



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Climax Molybdenum Company



MS-9A

(Continued from page 110)

for all-out five year mobilization. Only 15 per cent of nickel supplies now goes for civilian industry.

There is little hope of any increase in nickel supplies for at least a year. Some new production is expected from Canada in 1954, but it will all go to the Government for defense purposes.

Capacity Steel Operations Now Forecast into Second Half of Year

Most steel executives are taking a more optimistic view of possibility of capacity operations in the second half of the year and have raised their sights accordingly. Order books of most producers show backlogs four months ahead for most of their products.

Not every steel executive is confident that the industry can operate at 100 per cent capacity through the second half of the year. An Inland Steel executive looks for a 90 per cent rate but no worse than that. The defense program, he said, takes 10 per cent of steel production which leaves 105 million tons for all civilian use in 1953. This would be 25 per cent more than was available in 1952.

Knock-Down Bus

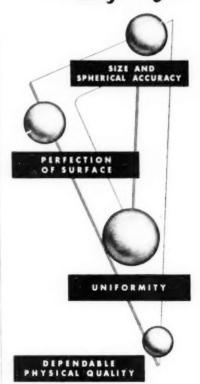
(Continued from page 61)

is driven by a longitudinal shaft off the engine.

Servicing is facilitated by mounting the maximum number of units in the front of the driving cab, access to them being by opening two hinged panels. The upper panel uncovers the Gemmer steering gear, the two windshield wipers, all the electrical fuses, and the air cleaner. Opening the lid of the lower compartment uncovers the battery, the power steering cylinder, and the horns. Brakes are Bendix with air application, the brake air line being entirely separate from that for other applications,

The coach has a capacity of 45 forward-facing passengers. Its overall length is 397 in., with a wheelbase of 200 in. Single tires are used front and rear. Total unloaded weight varies between 16,100 and 16,720 lb according to internal equipment. It is stated that there has been no increase in weight compared with the standard one-piece, all-welded coach.

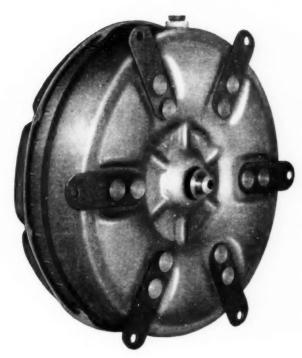
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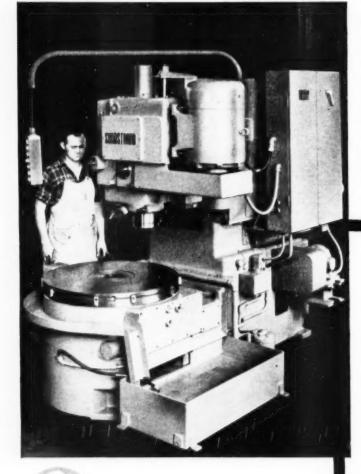
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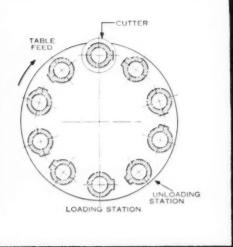
Check These Time Saving Possibilities of Sundstrand Rotary Milling Machines

Sundstrand standard vertical rotary Rigidmil milling machines have many possibilities for solving production milling problems. They can be furnished with one or multiple spindles. In all cases loading and unloading time is eliminated. Check into the possible application of a Rotary Rigidmil to your production milling. A Sundstrand engineer will be glad to help. There is no obligation for this service.

Single Spindle Applications

Photo and drawing to the left illustrate the design and operation of the single spindle machine. It is made in two sizes, 36" or 48" diameter rotary table. It has a 25 hp vertical head and can be furnished with either power or manual feed for cross positioning of the head carrier. Head is mounted on vertical ways for manual positioning. Machine can be provided with power elevating device for positioning of head or for automatic cutter retraction.



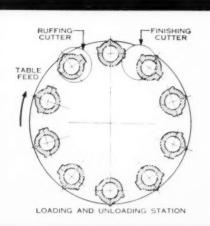


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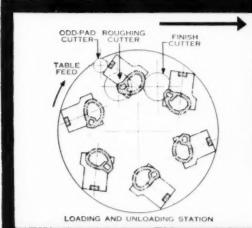


Two Spindle Applications

Basically the two spindle machine is the same as the single spindle rotary Rigidmil. The drawing to the left indicates how both rough and finish milling cuts can be made simultaneously. As in the case of all rotary Rigidmils, loading and unloading time is eliminated—operator loads and unloads while cuts are in progress.

Multiple Spindle Applications

Photo to the right illustrates a special tooling job on a 3 spindle rotary Rigidmil. In this installation, one cutter ruff mills the large pad, a second cutter finish mills this same pad, and the third cutter takes one cut on a small pad at a different depth — all with one clamping of the part. As in the other applications, operator merely loads and unloads the workpiece. Machines with four or more spindles can be supplied to meet the requirements of the job.





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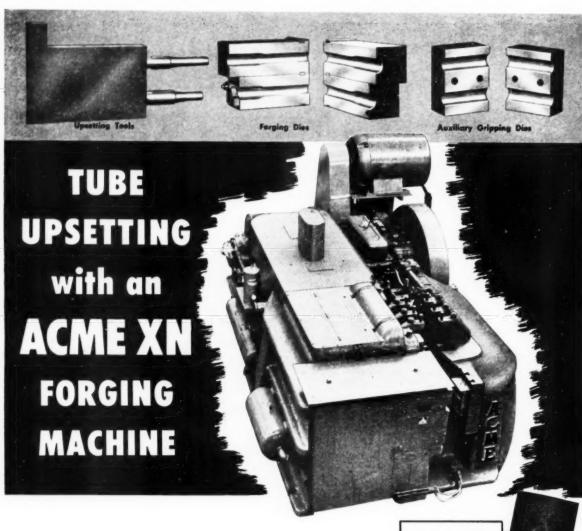
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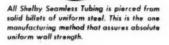
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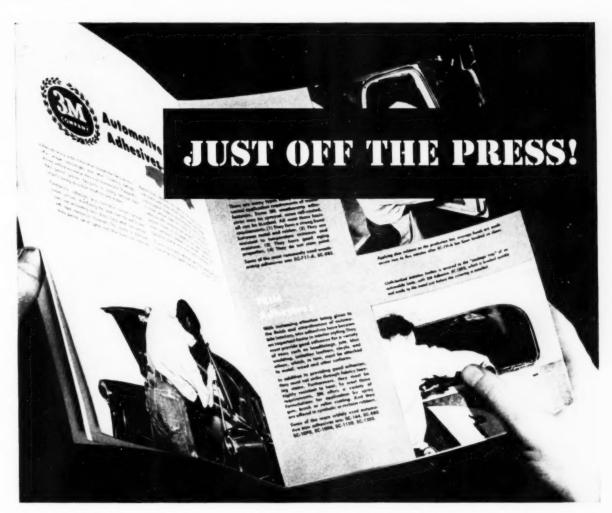
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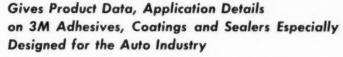
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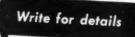
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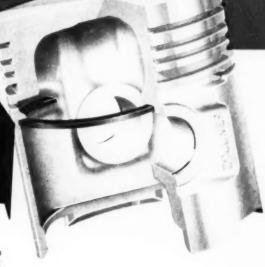
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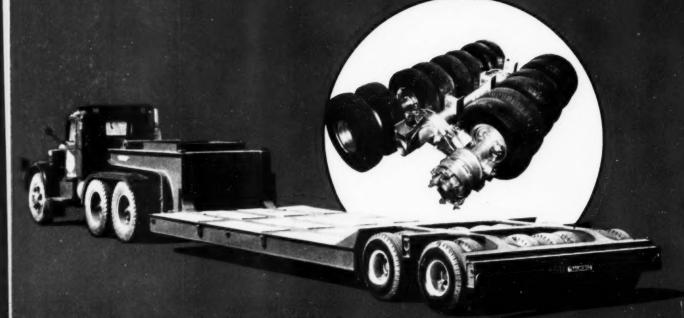
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